The JOURNAL of the NATIONAL DENTAL ASSOCIATION

VOLUME IV — NUMBER TEN

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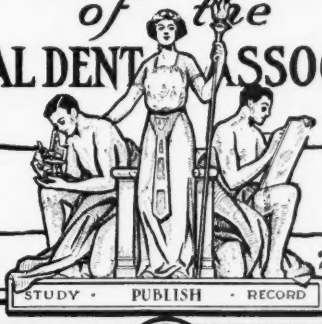

OCTOBER, 1917

Dental Root Cysts.

Granuloma and Diseased Root.

Chronic Apical Inflammation.

Conductive Anesthesia.

Pathology of War Surgery.

Filling of Root Canals.

Proving Cause of Pyorrhea.

Free Dental Activity of the New National Army and Directors.

Dental Ambulances.

Official Program of 1917 Meeting.

Course to Pursue in the Treatment of Pulpless Teeth.

Dental Students and the Draft.

Dental Officers Released from Serving as Privates.

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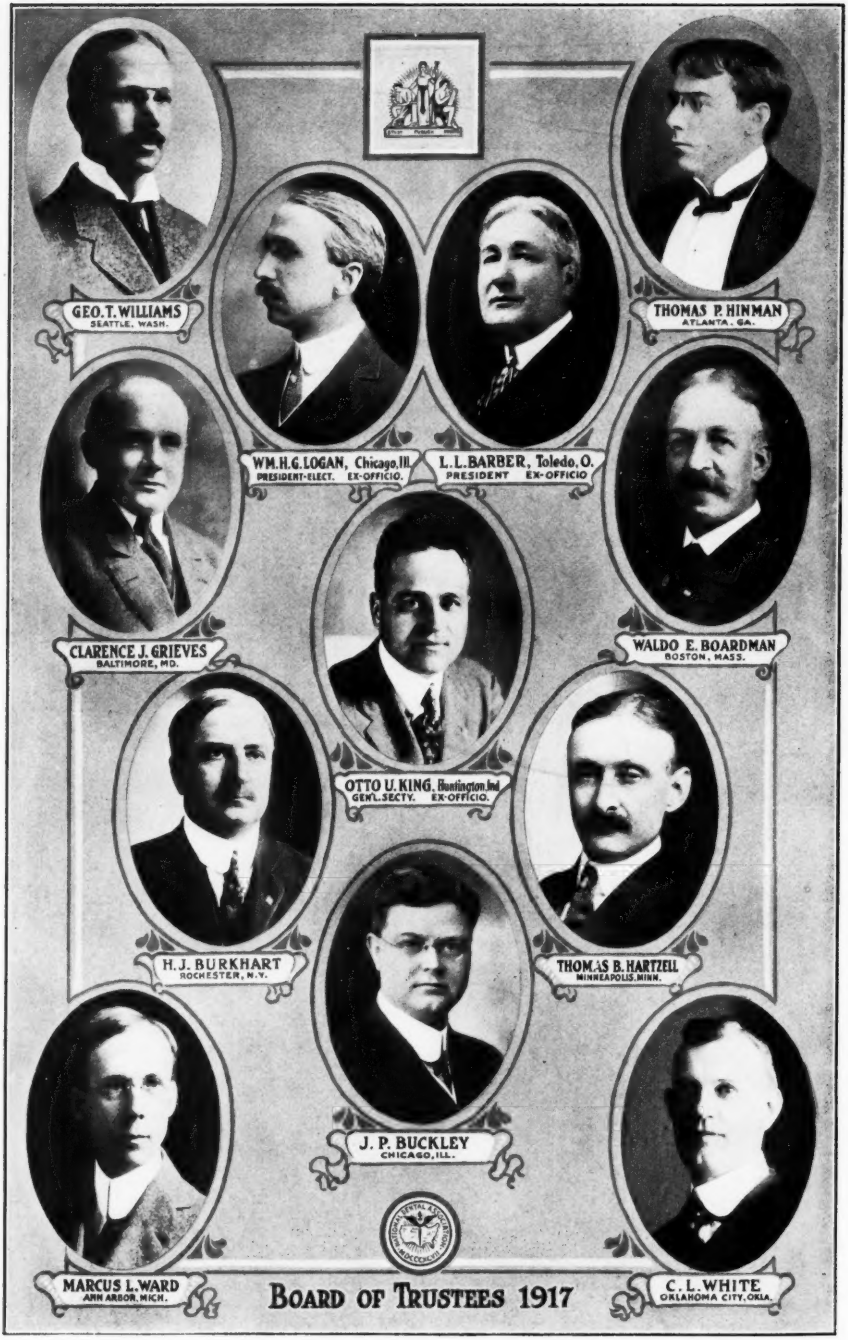

Board of Trustees 1917

THE JOURNAL
OF THE
National Dental Association
VOL. 4 OCTOBER, 1917 NO. 10

Original Communications.

THE MICROSCOPIC ANATOMY OF CHRONIC PERIODONTITIS AND THE PATHOGENESIS OF DENTAL ROOT CYSTS.

By Arthur T. Henrici, M. D., and Thomas B. Hartzell, M. D., D. M. D.

(From the Laboratories of the Research Institute of the National Dental Association at the University of Minnesota, Minneapolis, Minn.)

ALTHO chronic infections of the alveolar process have recently received a great deal of attention, and much has been written concerning the etiology of these diseases and their possible relationships to other pathological processes in the body, we have been unable to find in the English literature, either dental or pathological, any adequate description of the microscopic anatomy of these conditions. It is our purpose in this paper to supply such a description; in this we cannot claim any great degree of originality, for we have found in the foreign literature, particularly the German, many very complete studies, the conclusions of which have been largely confirmed by our own observations. Our data are drawn from a review of this literature and from the observation of material obtained from autopsies and operations. Ground sections of jaw with the teeth and soft tissues in situ have been prepared by means of a modification of Black's grinding apparatus which we have described elsewhere. In addition we have studied a number of paraffin sections of gingival tissues and of alveolar granulomata and cysts removed at operation. We have found decalcified tissue practically useless for finer microscopic studies.

It is not within the scope of this paper to discuss the etiology of the so-called pyorrhea alveolaris. There has been published a great deal concerning the

influence of constitutional disorders and the action of local irritants, especially salivary calculus; we have indicated in a previous paper our opinions concerning the bacteriology of this disease, giving reasons for believing that the mouth streptococcus is the most important agent in causing mouth infections. But there remains another factor in the etiology of pyorrhea which has not been sufficiently emphasized; this is the anatomical configuration of the gum. The gingival crest normally lies close to the tooth, forming a narrow trap-like orifice to the gingival crevice (Fig. I) thru which food particles may be forced in the act of eating. Such putrescible material is, however, not readily dislodged except by a careful toilet of the mouth and, undergoing decay, injures the exceedingly thin epithelial coat at the base of the gingival crevice. We believe that this cleft between gum and tooth is analogous to the crypts of the tonsils and to the vermiform appendix in this respect, and that progressive inflammatory processes occur so frequently in all these structures for the same reason. This factor in the etiology of pyorrhea was recognized by Talbot, but has not been mentioned frequently in other writings, and is, we believe, far more important than hypothetical constitutional causes.

The earliest changes in pyorrhea occur in that portion of the sub-epithelial fibrous tissue which lies just beneath the base of the gingival crevice. We have been fortunate in obtaining a ground section showing this stage of the disease, before gross changes were visible. The lesion is illustrated in Fig. II. Some of the epithelium has been torn away in grinding, but *there is no evidence of ulceration.* The inflammatory reaction is found immediately beneath the epithelium lining the gingival crevice, and does not involve the crest or outer surface of the gum; this fact lends additional support to the view that the structure of the gingival crevice is an anatomical predisposing factor in the etiology of pyorrhea. There are no pus cells present; the exudate is made up purely of small mononuclear cells, and of these the vast majority are plasma cells, the remainder being lymphocytes. This fact, we believe, is the most important that has been established by our microscopic studies of mouth infections, namely, that in the beginning stages of all forms of progressive periodontitis, the inflammatory reaction is always of this subacute character; the characteristic cells are plasma cells and *not* pus cells. The only other changes noted at this stage are the presence of distended, new-formed, thin-walled capillaries.

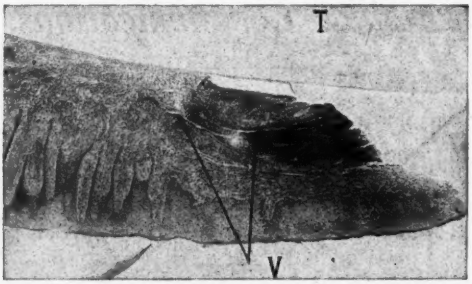

Figure I.

The microscopic description just given corresponds to that stage of the disease recognized clinically by tumefaction and

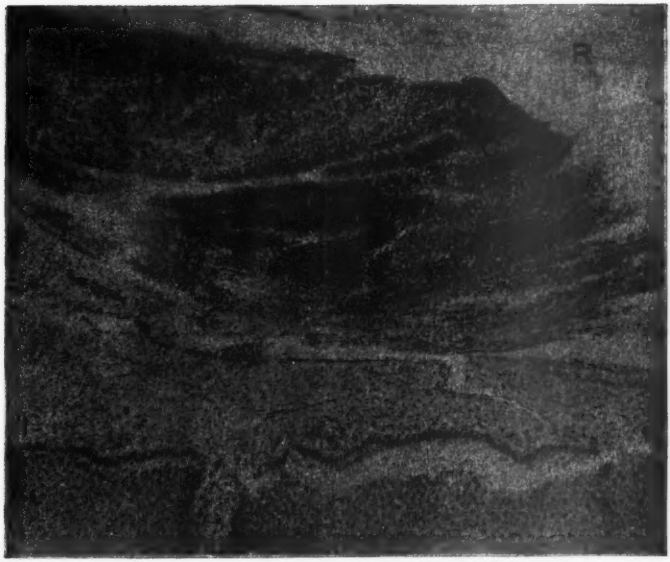

Figure 1.
Pyorrhea, early stage, showing infiltration of gingival tissue with lymphocytes and plasma cells. Note the congested capillaries. Low power.
R—Root surface. C—Capillaries full of red cells.

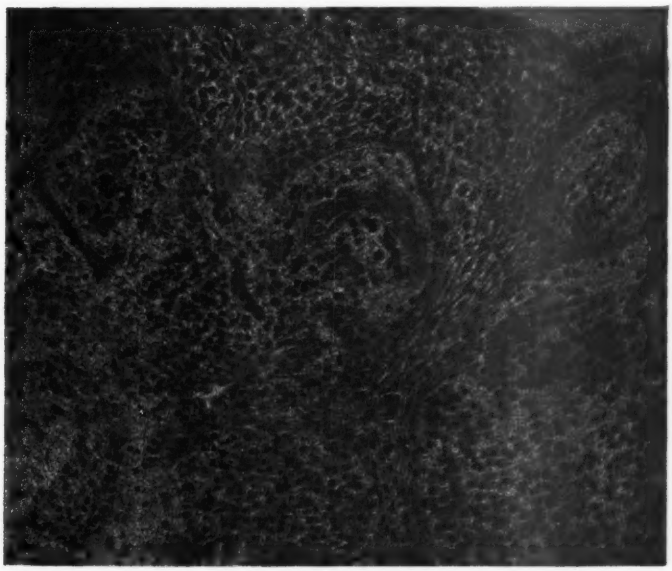

Figure 2.
Pyorrhea, showing hyperplasia of the gingival epithelium. Medium power.

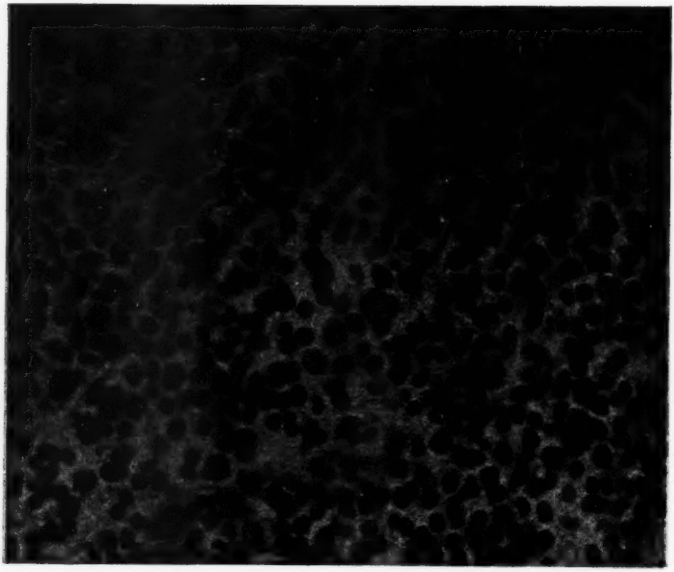

Figure 3.
Pyorrhea, showing the character of the infiltrating cells (plasma cells and lymphocytes.) High power.

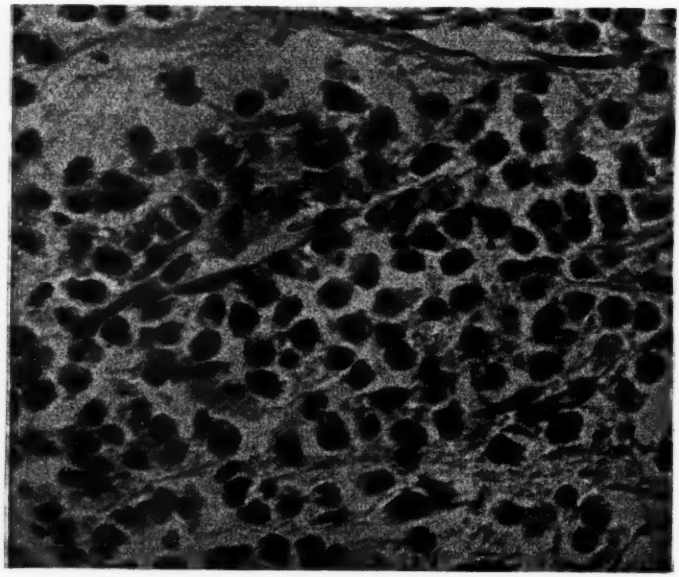

Figure 4.
Chronic alveolar "abscess." Plasma cells in spaces between the connective tissue fibers. High power.

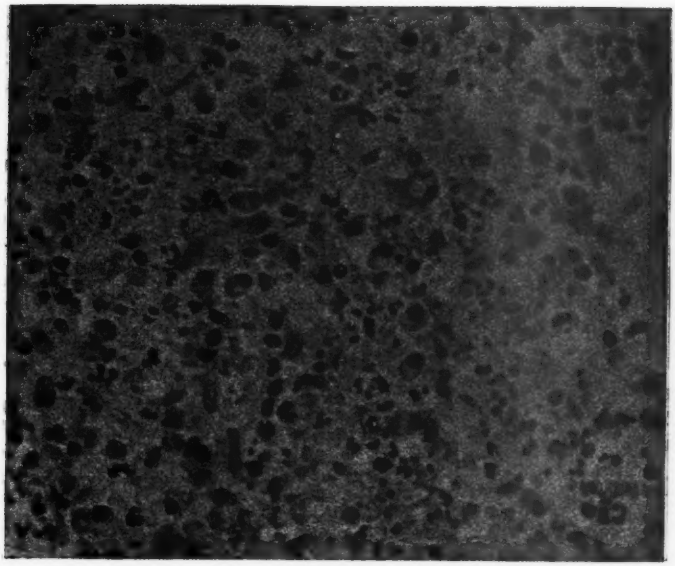

Figure 5.
Chronic alveolar "abscess" which has undergone suppuration. Disintegration of tissues, with polymorphonuclear leucocytes and free blood cells. High power.

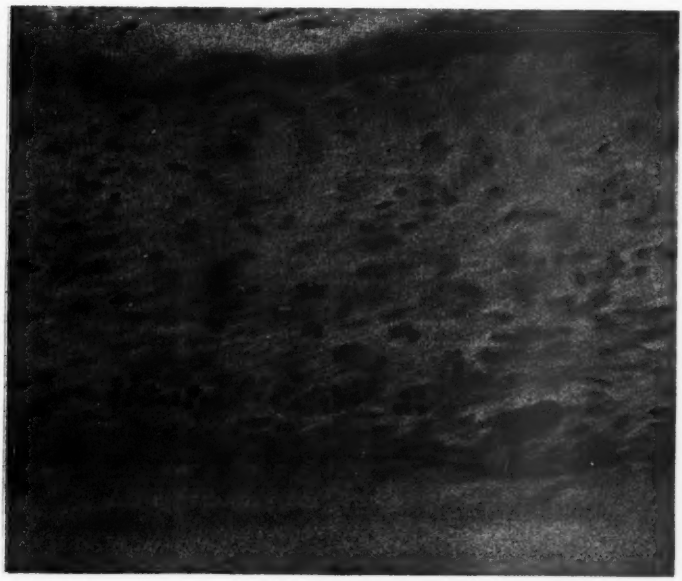

Figure 6.
Strand of epithelial cells ("débris epithéliaux paradentaire" of Malassey) in the peridental membrane, close to the cementum. Normal tooth. Medium power.

Figure 7.
Fully developed dental root cyst. Very low magnification.

congestion of the gums. It is well know that such a non-suppurative inflammation of the gums precedes the involvement of the peridental membrane with its pus-flow and resorption of the alveolar process, and there has arisen a clinical distinction between gingivitis and pyorrhea proper; pathologically, however, there is such a direct continuity between the two processes that we believe such a distinction unwarranted.

Studies of the advanced stages of this form of periodontitis have been made from sections taken from the soft tissues about the teeth removed at operation. These sections show a far more extensive infiltration of the fibrous tissues of the gum and peridental membrane with plasma cells and a few lymphocytes. This infiltration extends, above the alveolar process, to the basement membrane of the epithelium on the lingual, labial, and buccal surfaces. It extends into the peridental membrane as far as our blocks of tissue go (we have been unable to obtain sections in this stage showing the whole jaw with the tooth in situ). Thruout this area of inflammation we find numerous thin-walled capillaries, characteristic of granulation tissue everywhere. There are no polymorphonuclear leucocytes deep in the tissues. That surface of the tissue which is in apposition to the tooth presents no epithelium, but is an ulcerated surface. Here alone do we find pus cells. In the tissues bordering this ulcerating surface we find, in some sections, evidences of degeneration, particularly in deposits of lime salts; these calcareous masses occur within the tissues of the peridental membrane; they are amorphous; they are very evidently deposited from the blood as a result of degenerative tissue changes, and are quite distinct from salivary calculus.

From these descriptions it will be seen that ulceration and suppuration are purely secondary events in pyorrhea. The primary change is a *productive* inflammation, and the exudate is composed of those cells characteristic of subacute and chronic inflammations which are called out to combat mild, long-continued, irritants; this observation is in accord with our bacteriological studies which indicate that the nonpyogenic mouth streptococcus is the etiological agent. The ulceration, we believe, is to be explained as the result of interference with the nutrition of the epithelium, produced in part by the action of bacteria and their toxine in the submucous tissues, and largely by an obstruction to the circulation brought about by the mechanical pressure of the large mass of new cells, and by the congestion itself; the ulceration exposes to the mouth sur-

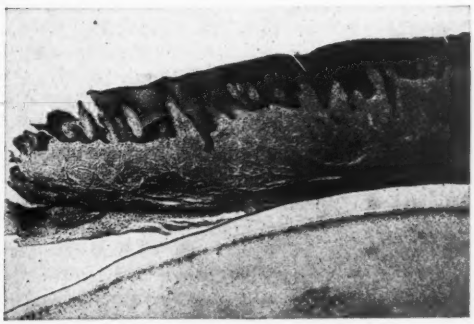

Figure II.

face, with its mixed flora, an unprotected tissue already weakened by infection, and leads to secondary infection by pyogenic bacteria and to a further extension of the process.

Why does the process remain localized to the peridental membrane? Several reasons may be offered. The tissues forming the gingival crevice receive their blood supply from vessels which pass from the apex of the tooth thru the peridental membrane and anastomose, over the crest of the alveolar process, with the vessels of the periosteum proper of the jaw; the primary inflammation, occurring just beneath the base of the gingival crevice, interferes with the circulation of only that portion of the tissue that lies immediately above it. The submucous tissues of the outer surfaces of the gums are relatively more cellular and more vascular than the dense peridental membrane, and possibly therefore more able to resist infection. More important, however, in explaining the extension of the process down the peridental membrane, is the disposition of the lymph vessels, which in our ground sections are shown clearly to pass from the tissues adjacent to the gingival crevice parallel with the tooth towards its apex; and here, as elsewhere, infection spreads along the course of the lymph vessels. These lymphatics may also serve to explain the occurrence of lateral abscesses which have hitherto been considered the result of hematogenous infection.

The epithelium of the gums is arranged in deep but regular papillae. When, however, the inflammatory reaction approaches the epithelial surface of the outer aspect of the gum, the epithelial cells are stimulated to growth, and form numerous irregular projections that penetrate in all directions into the inflammatory tissue. Many of the ingrowing strands of epithelium unite and enclose small islands of plasma cells surrounded by squamous cells. This epithelial hyperplasia bears a startling resemblance to early malignant change. We have, however, found it constantly in advanced cases of pyorrhea, and similar changes may be found in the epithelium of the skin in chronic granulomatous infections, particularly cutaneous blastomycosis.

Chronic inflammations of the peridental membrane at the apex of the tooth are variously known as chronic alveolar, apical, or blind "abscesses." This terminology has its origin in the erroneous impression that the inflammatory reaction is purplent in character, and that such chronic "abscesses" are the sequelae of acute abscesses; such is the impression received from the writings of Hopewell-Smith and Black. Since the Roentgen rays have come into general use in dental diagnosis, and since mouth infections have become of such widespread interest, we have come to recognize the fact that chronic peri-apical infections are far more frequent than was formerly supposed, and that they do not necessarily nor even frequently follow acute abscesses; indeed, our microscopic studies seem to indicate that acute abscesses are frequently secondary to, and implanted upon, chronic infections. Moreover, pathological studies have shown that these lesions do not often contain true pus, and that pus cells are not a constant nor characteristic element in the lesion, so that the more fortunate term "granuloma" is coming into general use. According to Partsch, acute abscesses and chronic peridontitis are from the beginning distinct Pathological processes; he says, "Acute periodontitis leads to softening of the tissues and pus formation, the chronic form to inflammatory new growth. Chronic periodontitis is not often the sequel of the acute stage, but is from the beginning a particular kind of inflammation."

An apical granuloma appears grossly as a spherical mass of tissue that peels out readily from its cavity in the jaw and frequently remains attached to the

root of the tooth in extraction. On section it is found to have a fibrous capsule, continuous with the peridental membrane, which contains a mass of very soft, grayish tissue, and at times fluid, or semifluid yellow caseous material or small specks of solid cheesy substance. The microscopic picture varies greatly, but this variation depends upon progressive changes in the granuloma, and the different appearances represent merely different stages in the development of the lesion. There are certain elements in the microscopic picture which are constant in all stages, and which occur in the beginning of the lesion alone; all other changes are secondary, however constantly they may occur. We shall describe first, then, what we choose to call the simple, or pure, periapical granuloma.

Under the microscope there are to be recognized the two portions seen grossly, namely a firm fibrous capsule, and a loose, cellular, medullary portion. The capsule is composed of dense white fibrous tissue of the adult type; the cells are not numerous, and the collagen fibers are thick and frequently hyaline in character. The central portion has very little connective tissue stroma, which is of the embryonic type; i. e., it is not rich in collagen fibers, and those that are present are thin, delicate, and rather widely separated, while the connective tissue cells are more numerous, are large, with pale oval nuclei, and the general characters of fibroblasts. This stroma supports delicate, thin-walled capillaries frequently distended with blood. Scattered thruout this tissue are large numbers of inflammatory cells; these are practically all mononuclear cells, but a few scattered polymorphonuclear leucocytes are usually found. The majority of the mononuclear cells present are plasma cells, and the remainder are lymphocytes. These cells at times form dense aggregations, but more commonly are diffusely scattered thru the tissue, lying free in spaces between the thin connective tissue fibers, separated from each other and probably bathed by fluid.

Plasma cells are so numerous and constant in apical granulomata that some of the German dental pathologists have applied the name "plasma" to this lesion. We have found these cells equally numerous and constant in pyorrhea. Since they are so characteristic of the inflammatory lesions of the peridental membrane, they deserve more attention. Plasma cells are somewhat larger than lymphocytes, and tend to be oval in shape, rather than round. They contain a single spherical nucleus which is usually situated eccentrically; the chromatin of the nucleus is frequently arranged in granules at the periphery with a single granule in the center, producing the appearance known as the "cart-wheel" nucleus. The rather abundant cytoplasm often contains a vacuole of hyaline material close to the nucleus. The cytoplasm tends to take the basic stains, particularly the pyronine of the pyronine-methyl green mixture; in this regard they appear to be related to the peculiar fibroblastic cells which we have found in the myocardial lesions of rabbits produced by mouth streptococci.

Concerning the origin of plasma cells, much has been written, and little is known. The origin of these cells in lesions of the peridental membrane has been studied particularly by Rumpel, who believes that they are derived from the connective tissue cells, and by Proell, who ascribes their origin to lymphocytes which have emigrated from the blood vessels. The significance of these cells is equally obscure. What function they perform in the inflammatory process is not known; they have little, if any, phagocytic properties. This much seems certain, that like the lymphocytes, they are called out in response to low grade irritants of long duration, and are therefore characteristic of chronic inflammations. Why they should be so particu-

larly numerous in peridental lesions is not clear, but we find the same cells predominating in chronic inflammations of the cheek and tongue and other portions of the mouth, and to lesser degree in the tonsils, and indeed in all mucous membranes; they seem, then, to have a certain anatomical significance.

Variations in the histological picture of periapical granulomata are produced by secondary changes. These belong to two orders; 1st, retrogressive changes in the granulation tissue; and, 2nd, the peculiar changes to be described later produced by invasion of epithelium leading to cyst formation. In an unstable inflammatory tissue of this kind, continually acted upon by bacteria and their irritating toxic products, and contained within a bony cavity where sudden increases in pressure may lead to interference with circulation, it is not surprising that degenerative changes of various kinds are found. These degenerative changes take place for the most part in the center of the granuloma and lead to a gradual disappearance of the cellular elements and their replacement by unorganized material, so that the solid mass is ultimately converted into a sac.

Among the changes of this character the first to be mentioned is the accumulation of fluid. The presence of this fluid has been explained in various ways. It may be the result of inflammatory edema, but the irritant acting is evidently of so low grade a character, as indicated by the cells called out, that it could hardly be expected to produce a serious exudate. It has been suggested by Parish and Römer that fluid accumulates as a result of mucoid degeneration of the cellular elements, particularly the connective tissue; but Proell points out that mucin cannot be demonstrated by appropriate staining methods, and that the fluid is found in that part of the lesion which is poorest in connective tissues, namely, the central portion. The edema is most likely due to circulatory disturbance, either from the mechanical pressure of a growing mass confined in a bony cavity, or, according to Proell, from degenerative changes in the vessels themselves. This interference with circulation, and consequently with nutrition, also serves to explain the gradual disappearance of the cells which accompanies the accumulation of fluid.

Fatty degeneration is a more common type of retrogressive change seen in these lesions. Within the granulation tissue there may frequently be found very large cells, singly or in masses, containing a small central nucleus, and a clear vacuolar protoplasm. The vacuoles represent fat globules which have been dissolved out in the process of preparing paraffin sections. The origin of this fat has been particularly studied by Proell, who found the earliest accumulations in the plasma cells themselves. Either neutral fat, or lipoids, or both, may occur. As the fat increases in amount, the cells increase in size, and Proell believes that some of the very large cells described are derived from the plasma cells. The accumulation of fat is itself an indication of degeneration in the cells, which sooner or later disintegrate and set free their contained fat; so that by appropriate staining methods free globules of fat may be found in the tissues. This is also accompanied by the formation of cholesterin crystals which form their characteristic clefts in the tissues. The free fat, and particularly the cholesterin, acting as foreign bodies, attract those large mononuclear cells known as macriphages, which surround and ingest the fatty material. These cells, according to Proell, are derived either from plasma cells or from the fixed connective tissue cells; they are, however, more commonly believed to be wandering endothelial cells. They soon become filled with fat or lipoids, which do not stain by the ordinary methods, and they are the large clear cells that were previously mentioned. The accumulation of fat

and fatty acids changes the normal gray, semitranslucent color of the granuloma to an opaque yellow, and accompanied, as it frequently is, by an accumulation of fluid and destruction of the solid elements, leads to the formation of a thick, semifluid yellowish substance in the center of the lesion which no doubt has frequently been mistaken for pus and has given rise to the erroneous impression that these lesions are abscesses.

We have found at times in apical granulomata another type of degenerative process; this is the deposition of lime salts in amorphous form, as was also noted in pyorrhea. Such calcification has been seen in the heart of the granuloma, accompanied by, and most likely secondary to, fatty changes, particularly the accumulation of fatty acids. Similar lime deposits have been noted more frequently, however, in another portion of the lesion, namely, its firm fibrous capsule; here there is no evidence of fatty change, altho hyaline degeneration is frequently found. The immediate proximity of this fibrous tissue to the bone of the alveolar process which is undergoing absorption suggests the possibility that the setting free of calcium salts from the latter tissue may have something to do with its deposition in the former.

The microscopic picture may be further altered by secondary invasion by pyogenic bacteria leading to a purulent exudation. We have repeatedly found periapical lesions showing the fibrous capsule and granulation tissue of the simple granuloma, indicating a chronic and long continued inflammation, but also containing a small drop or two of liquid pus; from such lesions we have regularly cultivated *Streptococcus viridans* together with *Staphylococcus albus*. Such lesions show the characters of the simple granuloma previously described, but scattered thru the granulation tissue there are found numerous polymorphonuclear leucocytes. There is also considerable fluid in the tissue, so that the cells are separated, and many of the cells, particularly the pus cells, are disintegrating. In these lesions we also frequently find a number of large endothelial phagocytes taking up the dead pus cells and débris (Fig. III). They are clearly the same cells that are found accompanying fatty changes. Such a purulent disintegration is clearly an accident in the development of the lesion, and does not occur in the majority of instances. In one case this was proven conclusively; previous history and radiograph demonstrated the development of a granuloma; sudden acute inflammatory symptoms led to the extraction of the tooth; sections of the lesions showed the microscopic characters described and cultures yielded the two organisms named. We have no doubt that such cases are common; that acute abscesses more frequently develop as secondary infections of chronic granulomata, rather than that the latter lesion is the sequel of the former. According to Dependorf, such secondary purulent changes may rapidly subside without fistula formation, leaving, as a result of the disintegrating activity of the organisms and the leucocytic ferments, an area of softening or even a cavity within the mass.

Since it has been shown that neither "pyorrhea alveolaris" nor "chronic alveolar abscess" are primarily purulent inflammations, it is quite evident that the names of these diseases are incorrect. The term "pyorrhea" seems to be firmly fixed in the literature, perhaps because pus flow is so constant a manifestation of the late stages of the disease. It has been generally adopted by the German writers. The French "arthrite alveolodentaire" is based on a false anatomical conception, but in a way serves to indicate that the peridental membrane is involved; they have also used the term "gingivite expulsive." Talbot clearly recognized the nature of the pathological procession in "pyorrhea," and conse-

quently the error of the name. His term, "interstitial gingivitis" is, however, not acceptable because it is doubtful whether "interstitial" can be appropriately applied to the fibrous tissue supporting surface epithelium or to the peridental membrane, and because "gingivitis" emphasizes too strongly the beginning inflammation of the gums and does not take into account the progressive involvement of the peridental membrane. In Europe, the nature of the periapical lesions has been clearly recognized from the first, and the German name "Wurzelgranulom" and the French "fongosité radiculaire" indicate correctly the nature of the inflammatory process; as has been stated, the name "apical granuloma" is coming into general use in this country.

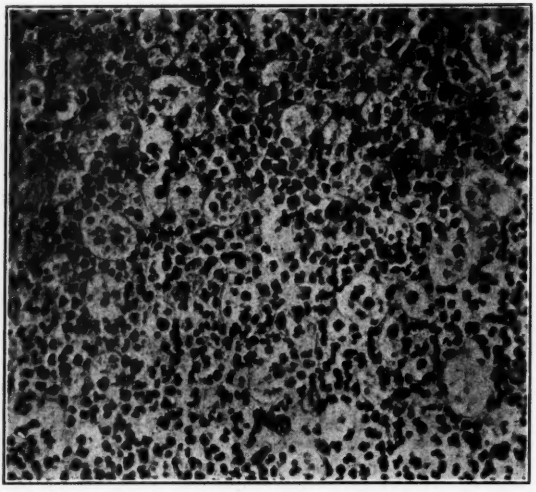

Figure III.

Both "pyorrhea" and apical "abscess" have many features in common; the differences are only those of location. Both are associated with the same organism, the mouth streptococcus, invading in one case thru the gingival crevice, in the other thru the root canal. Both are inflammatory diseases of the peridental membrane, involving in the one case primarily that portion which surrounds the neck of the tooth, and in the other primarily that which surrounds its apex. In both the processes are the same, a chronic progressive granulomatous inflammation characterized by identical cellular elements. We believe that an acceptable terminology should indicate this identity of the two processes; such a nomenclature has been supplied by Römer, who applies the name "chronic lateral periodontitis" to the condition known as "pyorrhea," and the name "chronic apical periodontitis" to root "abscesses."

Chronic apical periodontitis may possibly undergo resolution without further change, but such is seldom the case. The destruction of the enamel and dentine, which cannot regenerate, and the invasion and death of the pulp, exposes the deep peridental tissues to infection; and if it were not for the peculiar process about to be described, whereby these tissues are covered over by epithelium and so protected from the exterior, continu-

ous re-infection would occur, and it is doubtful if healing could take place at all without expulsion of the teeth. This process, whereby the granulomatous mass is converted into an epithelial-lined cyst, has received considerable study abroad, and there has arisen quite a controversy concerning the origin of the epithelium and the mechanism by which the cyst develops.

The earliest stage in this process which we have observed or seen described shows within the mass of granulation tissue areas of squamous epithelium, apparently in isolated patches, or islands (Fig. IV). If, however, serial sections be studied, as has been done by Malassez, these masses are all found to be connected. The epithelial structure so formed is arranged as a somewhat flattened mass interposed between the root tip and the granuloma proper; from it numerous long finger-like projections extend in all directions into the granulation tissue. Such an "epithelialized granuloma" is the commonest type of lesion found at the apex, and there is every indication that in the majority of cases the epithelium appears very early in the history of the lesion, shortly after the granulation tissue itself.

This epithelial mass increases in size, and as it does so, grows down into the center of the granuloma. From this central mass long narrow projections extend in all directions to the capsule of the lesion; these projections taper to a pointed extremity, and occur at fairly regular intervals, so that the structure has, in cross section, somewhat the appearance of a wheel with spokes, or rather, as the projections are sometimes curved, the blades of a turbine. The epithelium of which this tissue is composed has the characteristics of adult stratified squamous epithelium such as is found on the surfaces of the mouth cavity; it does not form keratin.

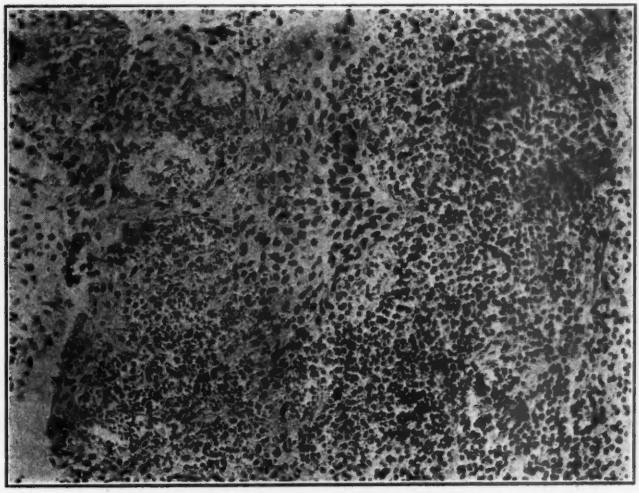

Figure IV.

The epithelial structure continues to grow, particularly as retrogressive changes occur in the granuloma. As it grows, the central cells become further and further separated from their blood supply, and soon degenerate. This de-

generation is apparently accompanied by an accumulation of fluid, for we find the cells in the center of the mass widely separated from each other, yet attached by slender prolongations, becoming stellate in shape, and taking on the general appearance of the external epithelium in the enamel organ. Fatty changes also occur in these cells, and they gradually die and disappear, leaving in the interior of the mass a cavity. This disintegration of the central portion also extends into the peripheral prolongations of epithelium as the latter increase in size, so that ultimately the granuloma, into which there project numerous small pedunculated masses of granulation tissue. (This stage of the lesion is beautifully illustrated in the article by Dreuw and Rumpel, Virchow's Archiv, 1910, 200, p. 89.)

The epithelial structure grows in response to the same irritant which produces the granuloma, and as long as the inflammatory processes continue, long narrow projections of epithelium are found extending into the granulation tissue. If, however, the infection is overcome and the inflammation subsides, the epithelial tissue comes to rest, and with the degeneration and absorption of the granulation tissue the cyst loses its irregularity of outline, the epithelium forms a smooth lining in direct contact with the fibrous capsule, and the cyst is fully developed. Such cysts form a nearly spherical sac, penetrated by the root of the tooth, and containing a thin, sometimes clear, but usually somewhat turbid fluid. The turbidity is due to fatty substances, particularly cholesterin crystals, and cell débris; within the fluid there may frequently be found large macrophages, often multinucleated, in the neighborhood of the cholesterin crystals. The epithelial lining of the cyst is smooth, regular, stratified squamous epithelium, without keratin formation; it completely covers the cyst wall save for that area occupied by the root tip.

The development of such cysts in periapical granulomata was first described by Malassez, whose very thoro studies leave but little further to be said.* He ascribed the origin of the epithelium to the remnants of the embryonic enamel organ found in the *peridental membrane which he had previously discovered and described.* The structures occur in the form of small islands or nests of epithelium (Fig. V), or more commonly as long narrow cords of cells which may branch and anastomose; they are found usually deep in the peridental membrane, and close to the cementum. The cells are closely packed together, often forming rosettes; they stain deeply and have little cytaplasm, so that their epithelial nature is not at first clear; by oblique illumination, however, their cell walls can be demonstrated and they are seen to be polygonal in outline, and to rest upon a basement membrane. They do not form a lumen, but are always arranged in solid clumps or cords. They are found about nearly all the teeth, and occur in most of the mammals. They are most numerous in the young, but may persist until late adult life. Malassez described three groups of epithelial rests: a superficial group occurring in the gingival region, derived from the dental lamina in the case of the temporary teeth, and from the gubernaculum dentis (which amounts to the same thing) for the permanent teeth; an intermediate group, derived from the outer portions of the enamel organ; and a deep group, occurring in the periapical region, derived from that portion of the enamel organ which forms the epithelial sheath of Hertwig. These structures were also discovered independently a short time

*Malassez' very complete studies of the development of the teeth, particularly the epithelial portion, of the origin of the embryonic epithelial rests in the peridental membrane, and of their transformation into dental cysts and tumors, have been gathered together and published posthumously by his pupil Galippe in the form of a monograph entitled, "Les Débris Epithéliaux paradentaire," Masson et Cie, Paris, 1910. The first of these studies was published in the Archieves de Physiologie, Vol. 5, 1885.

later than Malassez's publications by Black, who described them first as lymphatic vessels filled with lymphoid cells; later he recognized their epithelial nature, but refused to acknowledge their origin from the enamel organ and attempted to establish for them a glandular structure and function. Malassez's descriptions and illustrations are, however, very convincing and no one can doubt that these structures are true remains of the embryonic dental epithelium.

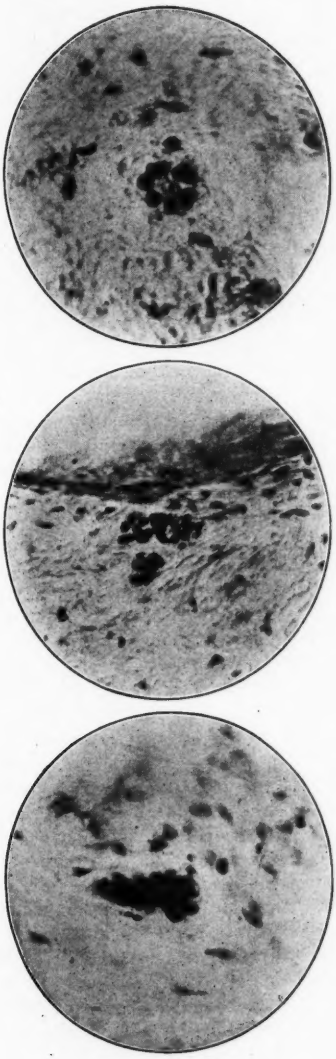

Figure V.

These small compressed masses of deeply stained cells present little in common with the large squamous cells that form dental root cysts; they have the appearance of cells that are undergoing atrophy and degeneration. They are, however, merely dormant, and according to Malassez's theories may be readily stimulated to growth and differentiation by the inflammatory processes. In describing the earliest epithelial invasion of root granulomata which he observed, he says, "This epithelial mass resembles the peridental epithelial débris both by its situation and its structure; it differs only in volume, which is considerably greater. And one might conclude that it is derived from such epithelial débris which, at the root tip, has been irritated, like the connective tissue of this region, has proliferated, has extended along the surface of the root whose ligamentous fibers have been destroyed, has penetrated the root canal, and has sent prolongations into the periradicular granuloma."

An entirely different theory as to the origin of these cysts has been offered by Grawitz. Contending that the common inflammatory root cysts bear no resemblance to those cystic tumors known to have their origin in embryonic remnants of the enamel organ, namely, the adamantinoma series, he believes that cysts develop in apical granulomata only after suppuration has taken place; that following such abscess formation, fistulae develop thru which the pus is discharged into the mouth cavity, and that when the acute inflammation subsides, the epithelium of the mucous membrane

of the mouth grows into the fistulous tract, and covers both it and the walls of the abscess cavity. Later, according to Grawitz, the fistula may heal, its epithelial lining disappear, leaving an isolated periapical cyst lined by squamous epithelium.

Several authors at once opposed this hypothesis of Grawitz, notably Astachoff, Proell, and Dependorf. Astachoff studied nearly a hundred specimens, in situ in the jaw, cutting serial sections, and failed to observe any connection between the epithelium of the cyst and that of the oral mucous membrane. As Dependorf states, Grawitz studied only the completed cysts, when the epithelial activity was over, and was thus unable to observe the changes by which such cysts actually develop; Astachoff and Proell, on the other hand, were able to obtain specimens in the early stages, and actually observed the hyperplasia of the epithelial rests in the peridental membrane in response to inflammatory irritation, thus confirming Malassez's observations. Grawitz's theory presupposes that all the inflammatory lesions which develop into cysts are primarily suppurative in character, and that the appearance of epithelium occurs late in the process; but Dependorf points out that epithelium appears often very early, and is found only in those lesions which are from the beginning granulomatous. According to the latter author, purulent inflammation is only an occasional and accidental process in these lesions, and when it occurs tends to destroy or inhibit the growth of the epithelium; it is the slow, chronic inflammation that irritates the peridental epithelial débris and stimulates it to growth.

Nevertheless, Grawitz's theory received some support. It was accepted by Guido Fischer and Landois, who also suggested another possibility, namely, that prolongations of the gingival epithelium, such as we observed in chronic lateral periodontitis, might invade the peridental membrane to the apical region. Such a theory was also advanced by Schuster. Later, Fischer offered a compromise theory, that the epithelial remnants in the peridental membrane are more or less related to and connected with the mucous membrane of the mouth. Adloff characterizes this "as a purely theoretical hypothesis which should be excluded from all serious discussions, and is moreover false." The latter author accepted the embryonic rests as the origin of most cysts, but felt that Grawitz's theory must be utilized to explain some, for he found two cysts in the neighborhood of the antrum of Highmore which contained ciliated columnar epithelium, similar to the mucous membrane of that cavity. That such cysts might occasionally arise in the manner described by Grawitz is admitted by most of the writers on this subject.

One can readily see why Malassez's observations and theories are not accepted without question. In the first place it is hard to consider structures so numerous, constant, and persistent as the epithelial bodies of the peridental membrane to be embryonic rests, generally thought of as rare and accidental. Noyes states that "it has never seemed proper to regard them as embryonal remains, for while, like all the cellular elements, they are more numerous in young people than in old, they are persistent thruout life. They have been shown in the membrane of a man aged seventy years, and it does not seem logical to suppose that embryonal débris that was useless to the organism would persist thruout life." Secondly, the common dental root cysts bear little resemblance to those new growths whose origin is attributed to embryonic remnants. Such new growths, very evidently arising from embryonic remnants of the enamel organ, are found in the jaw, as adamantinomata, multilocular adamantinomatous cysts, and dentige-

rous cysts; these tumors are composed of epithelium having embryonic characters, exhibited in their ability to grow extensively and independently, and to differentiate in various ways, producing a wide variety of structures. Malassez attempted to trace resemblance between these tumors and the simple cysts above described. The latter, however, are quite distinct from the former. They have no neoplastic tendencies nor embryonic characters; their activity is limited to growth in response to a definite stimulus, the irritation of chronic inflammation, and when that inflammation subsides the epithelium becomes quiescent; their cells are not pluripotential, but develop only into simple squamous epithelium. Adloff believes that the adamantinoma series of tumors is derived from accidental embryonic remnants of the enamel organ, but that the epithelial structures commonly found in the peridental membrane are derived from that portion of the embryonic dental epithelium which forms the sheath of Hertwig, the function of which is to mould the contour of the forming root and the cells of which do not form odontoblasts; it is from these latter cell rests, according to Adloff, that simple dental root cysts develop.

We agree with the authors quoted that the epithelial structures found in the peridental membrane cannot be considered accidental embryonic rests. We believe that they are separated from the enamel organ (such a "budding off" process has been described by Malassez) and are left behind in the peridental membrane to fulfill a function when called upon in later life. This function we suggest to be the formation of epithelial structures in chronic periapical granulomata such as we have described. As we stated before, once the crown of the tooth is perforated and the pulp exposed, there is no method of protecting the tissues of the jaw from infection save by the prolification of such epithelial structures. By cyst formation there is interposed between the exposed tissues and the outside world a layer of stratified squamous epithelium, the type of tissue that forms the best barrier against bacterial invasion. Viewed from this standpoint, cyst formation becomes the process by which chronic apical periodontitis undergoes healing; a process that is remarkable and unique.

Such healing is, however, seldom perfect or complete. We have usually found areas in the cyst wall where inflammatory reaction was still evident, forming small vegetations of granulation tissue pushing the epithelium forward into lumen of the cyst; and we have nearly always recovered the mouth streptococcus from cultures taken from the cyst wall. Such a process of healing is imperfect, also, from a mechanical standpoint; the cyst contents are organic material forming an excellent culture medium, and are open to invasion by bacteria thru the root canal, producing to an even greater extent, conditions similar to those found in the gingival crevice, the crypts of the tonsils, and the appendix, such as was described at the beginning of this paper. Contrary to the experience of Dependorf we have seldom found the cyst contents sterile. The growth of microorganisms in the stagnant cyst contents undoubtedly leads to destruction of the epithelial lining in places, to invasion of the subepithelial tissues, to further destruction of bone, to further granulation tissue growth, and ultimately to further extension of the cyst which may become as large as a walnut in some cases. Viewed from this standpoint dental root cysts are not to be considered as harmless lesions, but as evidences of a previous infection which may still be active and which will, most likely, recur. As focal infections from which metastatic lesions may develop, they should be considered almost as dangerous as the pure granulomata themselves.

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FURTHER PROOF.

In Nineteen Hundred and Fifteen, one of the authors of this paper made the statement, which was published in both The Journal of the National Dental Association and the Dental Review, that "We certainly must concede that the bacteria which we find constantly deep in the tissues are the ones logically concerned in the inflammatory disturbances going on in these tissues," and again, "While the author has not proven the streptococcus viridans to the specific organism, he is thoroly of the opinion and belief that this family of viridans is the chief offender, because of its universal presence in the pockets and in the tissues and because of its definitely proved relationship to dental abscesses and secondary lesions. It is not proven, however, that it is certainly the etiological factor, tho the evidence is slowly accumulating which in the end may be accepted as proof, sufficient to justify our believing it to be the specific factor."

In this article, which is contributed by Doctor Henrici and myself, we offer still further proof that the streptococcus viridans is the chief etiological factor in the causation of pyorrhea, that proof being the character of inflammatory mass at the point of inflammation, which we find to be chiefly lymphocytes and plasma cells. This striking characteristic is true of streptococcus invasion. Whether it be in the gum margin, the granuloma, muscle lesions of either the non-striated or striated type, in kidney tissue or about a joint, the response to the irritant is always the same, chiefly lymphocytes and plasma cells. This fact adds one more link in the chain of evidence fastening upon the streptococcus viridans the chief etiologic role in inflammations occurring about the dental organs.

The fact that we have many cases of inflammation of the gums of long standing in which we have bleeding but no pus with streptococcus viridans the principle inhabitant of the pocket is another link in our chain of evidence. After preparation of the tissues by chronic streptococcus viridans infection for a greater or less period of time, we find grafted upon the tissues the additional factor of pus formation, which is evidence that staphylococci have gained the ascendent in the pocket. This course of procedure is entirely reasonable and in accord with the bacterial facts.

THOMAS B. HARTZELL.

A HISTO-PATHOLOGICAL STUDY OF THE DENTAL GRANULOMA AND DISEASED ROOT APEX.

From the Research Department of Harvard University Dental School.

BY KURT H. THOMA, D.M.D.

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INFECTIOUS granulomata are pathologically situated between pure inflammation and neoplasms. While we definitely know that a granuloma is of infectious nature, which is not the case with tumors, we find, on the other hand, that the injurious agent does not produce an actual destruction of tissue, such as occurs in acute or suppurative inflammation. The lesion represents a reaction to a mild injurious agent, which produces a proliferation of the fixed tissue elements with round-cell infiltration, and has a strong tendency towards necrosis, suppuration, caseation and other retrograde processes. To this type of lesion belong the tuberculous granuloma (tubercle), the syphilitic granuloma, (gumma, syphiloma), typhoid lesions in the intestines, granuloma in actinomycosis and the dental granulomata caused by devitalized teeth.

DENTAL GRANULOMATA.

DEFINITION. The dental granuloma is a chronic inflammatory lesion caused by a mild injurious agent, producing proliferation of the fixed tissue cells of the peridental membrane and infiltration of lymphocytes and leucocytes. The lesion grows at the expense of the bone, which, therefore, is always more or less involved. Necrosis, suppuration and other retrograde changes are secondary processes for which there is a marked predisposition.

The difference between an acute alveolar abscess and dental granuloma should be clearly understood. The former is a suppurative inflammation and involves a process of destruction of the peridental tissues. Unless the cause is entirely removed it results in a chronic alveolar abscess. The dental granuloma is a formation of new inflammatory tissue. Necrosis and suppuration may occur later, but play only a secondary role. The acute abscess starts with violent symptoms of inflammation, while the formation of a granuloma begins and continues without the patient's knowledge.

Sometimes a dental granuloma is described as a tumor, but this is not correct, as it is distinctly of infectious origin and histologically presents a picture of chronic inflammation. It has also been called a blind alveolar abscess. The word "abscess," while used by the pathologist to designate a circumscribed accumulation of lymphocytes or leucocytes, has a different meaning when used by the clinician. When speaking of an abscess, he thinks of a cavity filled with liquid pus, but this lesion is primarily an accumulation of inflammatory cells in the proliferating tissue.

ETIOLOGY. The lesion is formed by a reaction of the tissue to mild injurious

agents, which may be bacteria in small numbers and of low virulence, toxins caused by bacterial activity in the pulp canal and chemicals, such as formaldehyd, used in treatment.

SIMPLE DENTAL GRANULOMATA. The reaction which is caused by the injurious agent consists of a proliferation of the fibroblasts and vascular endothelium of

Figure 1.

Photomicrograph of granuloma stained with Mallory's Phosphotungstic Acid, Haematoxylin Method to bring out fibrous structure of capsule. There are two necrosed areas shown in the inner part.

the peridental membrane. The part nearest the source of the injury becomes infiltrated with lymphocytes and a small number of leucocytes and this focus of inflammation becomes surrounded by a fibrous layer which is continuous with the peridental membrane. Besides the increase in the number of cells in the focus, we have the formation of plasma cells as an important feature. These become very abundant and are seen as cells with irregular cytoplasm and from one to four nuclei in excentric arrangement. While all this is taking place the lesion gains in circumference and, while it may occasionally attain very large proportions, it is usually about the size of a pea.

At this stage the simple granuloma is surrounded by the fibrous capsule which extends into the medullary spaces between the trabeculae of the bone. This is the reason why in most cases the granuloma is held back in the jaw when the tooth is extracted. It is, however, occasionally connected so firmly with the peridental membrane that it stays attached to the extracted tooth. The thickness of the capsule varies greatly. The fibres are arranged in bundles and grow in various directions, as can be well demonstrated with special stains, such as Mallory's Phosphotungstic Acid, Haematoxylin method or Mallory's anilin blue stain, which colors collagen fibrils and reticulum of connective tissue blue. (Figure 1).

Vessels and capillaries are abundant among the fibres of the capsule. Their lumen is often greatly increased and contains red corpuscles, a granular substance and occasionally polymorphonuclear leucocytes. The endothelium often shows a proliferating appearance. Besides fibroblasts we find in this part plasma cells, especially near the vessels, but there are also occasional leucocytes and eosinophiles. These studies of the capsule impress on us the great effort of nature to wall off the seat of inflammation so as to prevent spreading into neighboring parts. It also demonstrates that this capsule does not prevent absorption, as it contains a meshwork of capillaries and is penetrated abundantly by larger vessels, thus establishing direct communication between the inner part, the seat of inflammation, and the circulation. Bacteria and toxins may therefore, be carried away by the blood stream. (See Figures 2 and 3).

The inside of the granuloma appears at first to be one great mass of plasma

cells, but careful examination reveals capillaries, which are often lined by only a single layer of endothelium, and morphonuclear and endothelial leucocytes and eosinophiles may be found in large or small numbers according to the

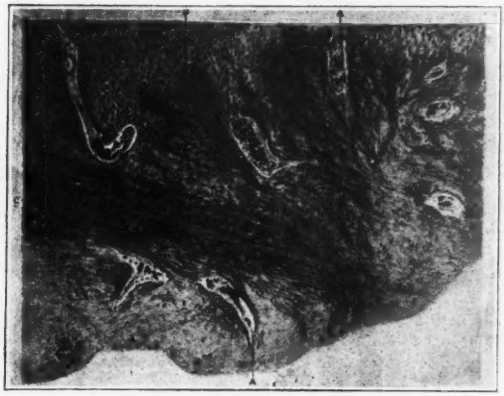

Figure 2.

High power drawing from specimen shown in Figure 1. A—Blood vessels extending thru the capsule to the inner part, (B). C—Connective tissue fibres in bundles.

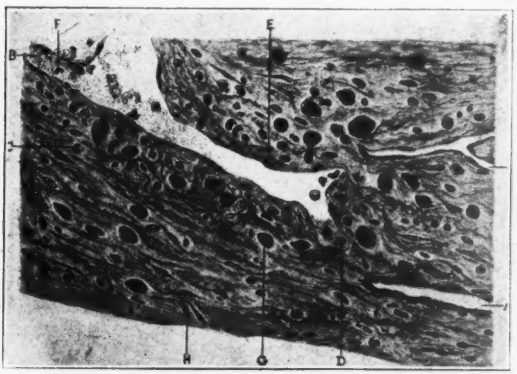

Figure 3.

High power drawing from capsule of granuloma shown in Figure 18, stained with Haematoxylin and Eosin. A—Blood vessels. B—Erythrocytes in blood vessels. C—Erythrocytes in tissue. D—Polymorphonuclear leucocytes. E—Endothelial cell of vessel. G—Plasma cell. H—Fibroblast.

occasionally are extremely dilated and crowded with blood corpuscles. Besides fibroblasts, which are encountered more or less frequently, we find lymphocytes, especially around the capillaries. Polyspecial condition which produced the tissue reaction. Erythrocytes are sometimes seen in various parts of the granuloma and are usually due to the extraction, which causes a rupture of the ex-

Figure 4.
SIMPLE DENTAL GRANULOMATA.
Photomicrograph of a root apex showing beginning of granuloma. The inner part shows darker due to infiltration of inflammatory cells, (lymphocytes, plasma cells and leucocytes), stained with Haematoxylin and Eosin.

Figure 5.
Photomicrograph of a tooth root with dental granuloma. Note the infiltration of inflammatory cells, (dark areas), between the fibrous tissue, stained with Haematoxylin and Eosin.

Figure 6.
Photomicrograph of root apex with granuloma partly detached from side of tooth. Note the lateral position of the apical foramen and granulation tissue extending part way into the canal.

Figure 7.
Photomicrograph of a granuloma from which the capsule has become detached. Note the lateral foramen and the dark bundles of connective tissue fibres. Stained with Mallory's Phosphotungstic Acid—Haematoxylin method.

Figure 8.

Photomicrograph of a large granuloma. Note the marked hyperaemia. The vessels, enlarged and crowded with blood, show dark and contain large numbers of erythrocytes and polymorphonuclear leucocytes. The tissue is infiltrated with plasma cells, lymphocytes and leucocytes, stained with Haematoxylin and Eosin.

Figure 10.

Photomicrograph of an epitheliated dental granuloma. Note how the epithelium grows on the surface of a cyst cavity at the side of the tooth. Stained with Haematoxylin and Eosin.

Figure 9.

Photomicrograph of root end with epitheliated dental granuloma. Note the dark bands, representing sections thru the epithelial net-work, which enclose inflammatory tissue. Stained with Haematoxylin and Eosin.

Figure 11.

GRANULOMATA WITH NECROSIS AND SUPPURATION.

Photomicrograph of dental granuloma showing large area of broken down tissue, forming a lumen. Stained with Haematoxylin and Eosin.

tended vessels. The infiltration is generally centered around the apex of the tooth and the inflammatory granulation tissue quite frequently extends part-way into the root canal, (See Fig. 6 and Fig. 39) which may explain some clinical observations which interfere with successful root canal treatment. (See Figs. 4, 5, 6, 7, 8).

EPITHELIATED DENTAL GRANULOMATA. Remnants of the embryonic enamel organ are commonly found in the normal peridental membrane of animals as well as man. They can easily be seen under the microscope and appear in small groups, islands or chains. The presence of epithelium is not constant in the peridental membrane and therefore is not regularly found in the dental granuloma. However, if epithelial cells enter into its formation the irritating influence of the chronic inflammatory condition causes proliferation and we find dividing and branching chains of epithelium which grow like a net-work thru the lesion. In a section they show as bands of uneven thickness radiating in various directions. The cells of the proliferating epithelium differ in appearance from the cells of the epithelial islands; they become large and the cytoplasm and nucleus grow more distinct. Leucocytes and plasma cells often invade the intercellular substance which loosely connects the various cells. (See Figs. 9, 10, 11 and 12).

DENTAL GRANULOMATA SHOWING NECROSIS AND SUPPURATION. Quite frequently we find one or two places in the granuloma where necrosis has taken place. A certain number of cells are seen detached from the rest and are more or less broken down. Polymorphonuclear leucocytes are then found in large numbers in the capillaries and in the tissue where the process of destruction is going on. The pus which is formed may be absorbed, which halts the infiltration of leucocytes and leaves a space or spaces in the central part of the granuloma. Such a space is called a lumen and may contain remnants of the decomposed tissue as well as inflammatory excretions from the pulp canal or remaining part of the lesion. The process of suppuration is usually caused by bacteria which emigrate from the root canal or are forced into the granuloma thru instrumentation. It is seldom very severe and is usually

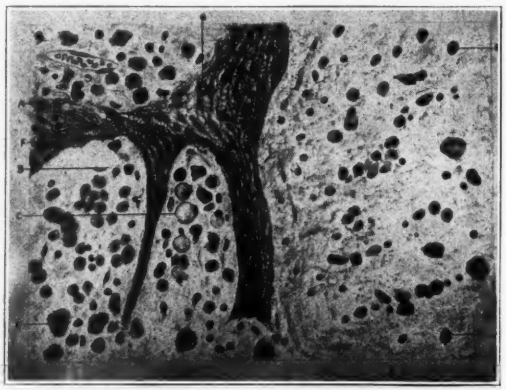

Figure 12.

High power drawing from epitheliated granuloma. A—Eosinophil. B—Fibroblast. C—Hyalin body formed in a plasma cell. D—Plasma cell with three nuclei. E—Plasma cell. F—Epithelium. Stained with Haematoxylin and Eosin.

Figure 13.

Photomicrograph showing granuloma with large lumen, due to absorption of necrosed tissue.

Figure 14.

Photomicrograph of a large granuloma in the state of a subacute attack. Note broken down tissue in center. The specimen shows infiltration of a large number of polymorphonuclear leucocytes. Stained with Haematoxylin and Eosin.

taken care of by the defensive forces of the body, which cause absorption of the pus. Occasionally, however, the destructive process becomes more extensive, tearing down the fibrous encapsulation and forming a sinus to the surface of the gums or face. Such a subacute alveolar abscess eventually involves the surrounding tissues and is clinically not different from the acute attack. (See Figs. 13, 14, 15, 16 and 17).

Figure 15.

Photomicrograph of granuloma with active process of suppuration, which has penetrated the capsule and formed sinus into the mouth. Stained with Haematoxylin and Eosin.

DENTAL GRANULOMATA SHOWING VARIOUS RETROGRADE PROCESSES. Besides necrosis and suppuration we find most frequent evidence of cholesterin formation, especially in old specimens and periodontal cysts. Cholesterin crystals may be recognized by the rhomboid spaces left by the crystals, which dissolve during dehydration in alcohol. They can be demonstrated, however, in frozen sections, in which they appear as brownish crystals. Foreign body giant

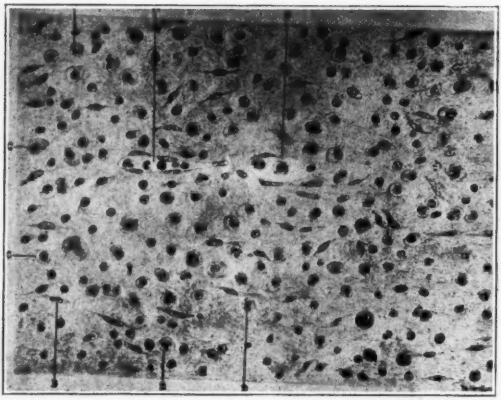

Figure 16.

High power drawing of part of granuloma shown in Figure 14. A—Vessels containing lymphocytes and polymorphonuclear leucocytes. B—Fibroblasts. C—Plasma cells. D—Polymorphonuclear leucocytes.

Figure 17.

High power drawing from specimen shown in Figure 15 showing detail of the small side branch of the sinus which extends towards the apex of the tooth. A—Mouth of sinus. B—Plasma cells. C—Blood vessels. D—Leucocytes. E—Polymorphonuclear leucocytes. F—Pus cells. H—Epithelial cells.

Figure 18.

Photomicrograph of a dental granuloma showing many rhomboid spaces due to cholesterin crystals. The granuloma shows also epithelial proliferation which starts to grow over the surface of the large and small lumen. This may be regarded as the beginning of a cyst.

cells frequently surround one or more of these crystals, as seen in Figure 24.

Figure 19.

Photomicrograph of dental granuloma showing fatty degeneration in one side of the capsule.

Occasionally fatty degeneration occurs, usually at the periphery just inside the fibrous capsule and collagen is often formed by the fibroblasts in large quantities from the fibrin of the inner part of the granuloma. This can be well demonstrated by Mallory's Analine Blue stain, which stains the fibrin and fibroglia fibres red and the collagen blue. Hyalin is found quite frequently. It accumulates in droplets of various sizes in the cytoplasm of the plasma cells, (Russell's Fuchsin bodies). Often the entire cell is so filled with hyalin that the nucleus is pressed to one side and nothing remains of the cell but the acidophilic hyalin bodies and a crescent-shaped nucleus. (See Figs. 18 to 24.)

All of these retrograde processes are shown in one or the other of the dental granulomata studied and reproduced in the various illustrations.

Dental Granulomata Showing Cyst Formation. If necrosis occurs in epitheliated granulomata we find that the epithelial strands have a tendency to grow between live and necrosed tissue, sometimes giving the appearance of an endeavor to encapsulate the tissue which has become destroyed. Such epithelial linings may actually be found to cover the entire inner surface of the lumen of a

Figure 20.

Photomicrograph of a dental granuloma removed by apicoetomy showing many spaces due to cholesterin crystals. Note also epithelial band on one side of the inner surface growing between capsule and degenerated part.

granuloma, which must be looked upon as the beginning of a periodontal or radicular cyst. The exudates accumulating in the lumen cause extension of the evidence of this by demonstrating that such cysts are almost always connected with a devitalized tooth, except in cases where the tooth has been extracted with-

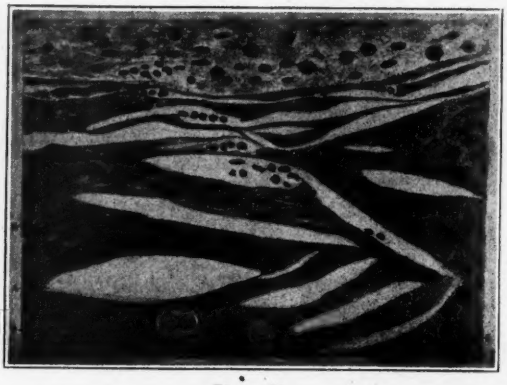

Figure 21.

High power drawing from specimen shown in Figure 18 showing cholesterin spaces. A—Space from cholesterin crystal. B—Fibroblast. C—Hyalin body in plasma cell. E—Plasma cells. Stained with Haematoxylin and Eosin.

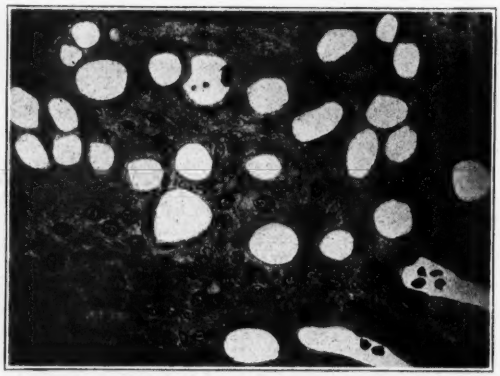

Figure 22.

High power drawing from specimen shown in Figure 19. Stained with Haematoxylin and Eosin. The specimen has suffered somewhat from decalcification.

cyst, which may grow to the large size with which we are more familiar clinically. A careful study of the history and pathology of this type of bone cysts shows that they are of infectious nature. Roentgen examinations give further out removing the epithelial granuloma or the partly-formed cyst. (See Figs. 25 and 26).

THE EFFECT OF DENTAL GRANULOMATA ON ROOT ENDS. Acute or chronic inflammation of the peridental mem-

brane, when of long standing, leaves its mark on the apex of the root.

Figure 23.

High power drawing from specimen shown in Figure 20, prepared with Mallory's aniline blue stain. A—Fibroblasts. The one in the middle is found on the surface of a large mass of collagen, stained dark blue, and apparently formed from fibrin, stained red, (B).

ism of the tooth. The cementum, which is porous then easily absorbs the products

Figure 24.

High power drawing from specimen shown in Figure 20, showing large foreign body giant cell (F), surrounding two spaces due to cholesterin crystals. A—Fibroblast. D—Connective tissue bundles. E—Space from another cholesterin crystal.

NECROSIS OF THE ROOT END. If the apical part of the peridental membrane has become destroyed or if its blood supply has been disturbed, we have a condition which abolishes entirely the metabolism of the tooth. The cementum, which is porous then easily absorbs the products of inflammation, and, becoming infected, forms an obnoxious foreign body, which nature tries to eliminate. Absorption starts at the surface and soon the cement presents a rough appearance which is too

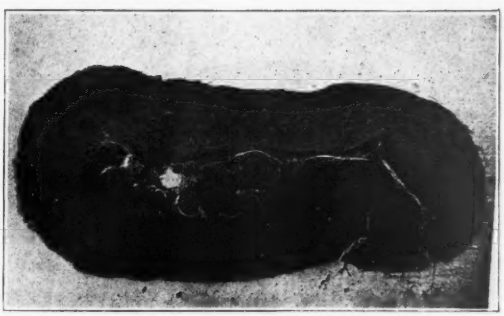

Figure 25.

Photomicrograph of cross section of granuloma removed by apicoectomy. Note the epithelial lining in the center of the lesion, stained with Haematoxylin and Eosin.

Figure 26.

CYST FORMATION.

Photomicrograph of section thru a small cyst sac, removed by operation from mandible. The cyst, which was well-rounded, collapsed during the process of fixation. Note the epithelial lining of the cyst, which was broken in places during the operation. Stained with Haematoxylin and Eosin.

Figure 27.

Photomicrograph of root tip with granuloma of very fibrous nature, (stained with Mallory's Phosphotungstic acid, Haematoxylin Method). Note loss of cement between A and B and rough appearance of root surface, due to absorption of dentine. Such a condition probably could not be recognized in a Roentgenogram, as it is of microscopic nature.

Figure 28.

Photomicrograph of distal root of a lower molar. The Roentgenogram shows no indication of a radiolucent area surrounding the apex of this tooth. The root, however, seemed shorter than the rest of the teeth. After extracting the tooth, reddish tissue was found covering the end of the root showing absorption of cement and dentine in the photomicrograph. A—Area between cement and dentine shown in Figure 32 stained with Haematoxylin and Eosin.

minute to show in a Roentgenogram. It is, however, easily recognizable under the microscope. (See Fig. 27). Occasionally the infection penetrates the cementum at some point and spreads rapidly between the dentine and cement in a peripheral direction. (See Fig. 33). More frequently, however, we find that osteoclasts form in large numbers along the surface of the tooth, producing well-marked indentations. The osteoclasts are of irregular and varying shapes with one, two or more nuclei. They are often connected with the tooth surface by fine processes. The absorption of the tooth root is very slow and differs somewhat from the same condition in the bone. There the dead part may finally be-

Figure 29.

Photomicrograph of section thru roots of a lower molar with granuloma at both apices and between the roots. Note absorption of the distal root. A—Absorption surface of dentine shown in Figure 31. B—Absorption surface of cement shown in Figure 30. Stained with Haematoxylin and Eosin.

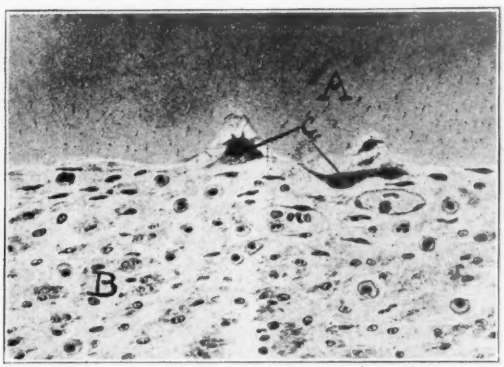

Figure 30.

High power drawing from specimen shown in Figure 29, showing osteoclastic absorption of the distal root. A—Oblique section thru dentine. B—Granuloma, (note capillaries with polymorphonuclear leucocytes). C—Osteoclast. Stained with Haematoxylin and Eosin.

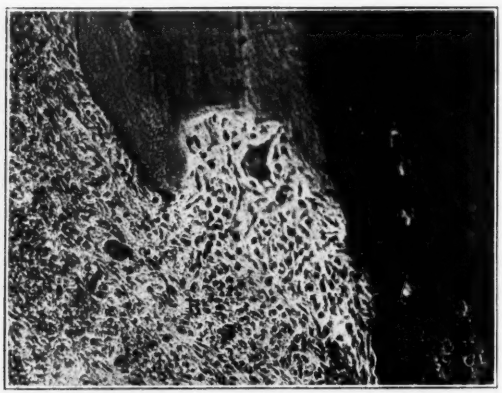

Figure 31.

Photomicrograph, high magnification, showing absorption of cement in specimen shown in Figure 29. A—Cement. B—Granuloma. C—Osteoclasts. Stained with Haematoxylin and Eosin.

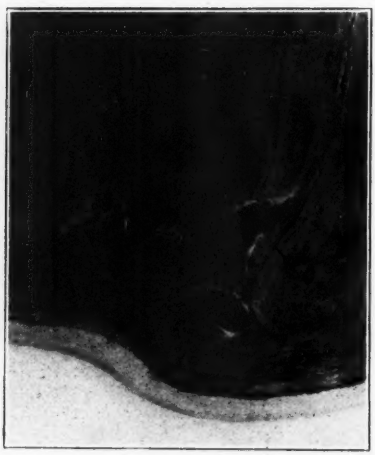

Figure 32.

High power drawing from specimen shown in Figure 28, showing osteoclastic absorption of both cement and dentine, especially progressing at the dento-cemental junction. A—Cement. B—Dentine. C—Osteoclasts.

Figure 33.

Photomicrograph showing necrosis of cement, due to the granuloma. B—Dentine. C—Hypercementosis. D—Infectious process between lamellae of the cement. Stained with Haematoxylin and Eosin.

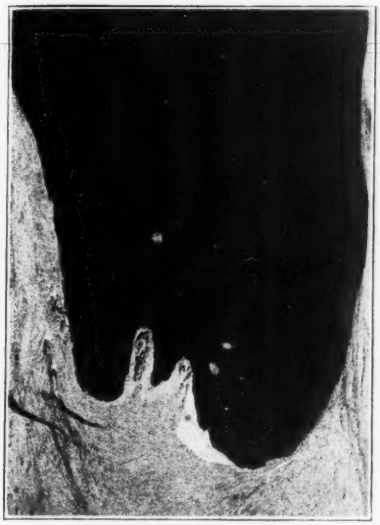

Figure 34.

Photomicrograph showing absorption of the end of a root with granuloma. Stained with Mallory's Phosphotungstic acid. Haematoxylin method.

Figure 36.

Photomicrograph of a root with granuloma, showing absorption of a large part of its apex. Note necrosed pulp, inflammatory granulation tissue and outline of absorbed dentine and cement. Stained with Haematoxylin and Eosin.

Figure 35.

Photomicrograph showing absorption of dentine and cement. Note outline of absorbed dentine and inflammatory granulation tissue. Stained with Mallory's Phosphotungstic acid. Haematoxylin method.

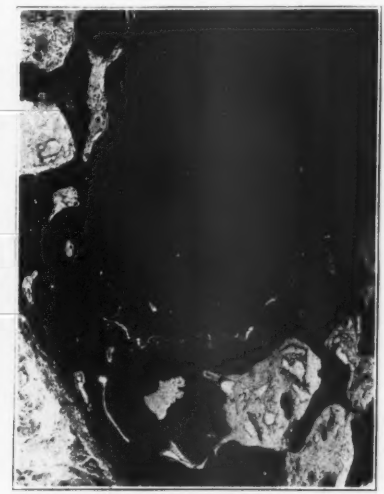

Figure 37.

Photomicrograph of the apex of the palatal root of an upper first molar, surrounded by peridental membrane and bone. The pulp of the tooth was infected and granulomata had formed about the buccal roots. The palatal root, however, shows only hypercementosis, probably caused by stimulation due to irritation from the inflammatory processes in the other parts of the tooth.

come separated and expelled as a sequestrum, while in a tooth we find gradual absorption only of the root. It starts at the apex, soon involves the dentine and makes rapid progress between the lamellae of the cementum and at the dento-cemental junction. After a certain amount of the apex of the tooth has disappeared we can easily diagnose the condition by means of the Roentgen method. (See Figs. 27 to 36).

Figure 38.

Photomicrograph of root of a lower molar showing hypercementosis. A large number of lamellae of cement have been deposited around the surface of the tooth, apparently covering the apical foramen.

HYPERCEMENTOSIS. The fibres and cells of the peridental membrane have a wonderful resistance to disease. The cementoblasts very often remain vital and are stimulated to activity by the irritating influence of chronic inflammation. This may result in the formation, layer upon layer, of new cementum, which causes a considerable enlargement of the contour of the apex of the tooth. (See Figs. 37, 38 and 39). Even after a considerable part of the cement and dentine have been destroyed, we may get new formation of cement and in sections we often find evidences of large absorbed areas extending deep into the dentine, which have become filled in with new cement. Cement may even be found completely lining the inner surface of the root canal, as seen in Figure 39.

Figure 39.

Photomicrograph of the apex of a tooth with granuloma. Note that the granulation tissue extends into the root canal. A—Indicates a place in the dentine which, after having been absorbed, has filled in with cement. Cement has also been deposited on the inner surface of the apical part of the root canal.

The microscopic study of these conditions is not only of scientific interest, but of real practical value, as it forms the foundation upon which we should base our methods of medical as well as surgical treatment.

Boston, Mass.

PERSISTENT CHRONIC APICAL INFLAMMATION AND ITS TREATMENT.

By John Sayre Marshall, M. D., Sc. D., F. A. C. S., Berkeley, Cal.
(Captain U. S. Army, Retired.)

(Read before the San Francisco District Dental Society.)

SOME twenty or more years ago it was my privilege to prepare a paper that was read before the New York Odontological Society entitled *"A Plea for the Extraction and Replantation of Teeth for the Cure of Persistent Alveolar Abscess."* In this paper I advocated the following method of treatment, namely: The extraction of teeth with chronic dento-alveolar abscess, amputation of the diseased apex, filling the root canal with gutta-percha, sealing the apical foramen and the cavity in the crown with gold and after thoro sterilization, replanting the tooth.

I am fully aware that in again presenting my individual views upon this subject I shall run counter to a very strong and ingrained prejudice against extracting and replanting teeth, for any cause, which has gotten a firm grip upon the minds of the dental and oral specialist.

To attempt to break down a prejudice is often a thankless task. It is like bucking one's head against a stone wall. The wall suffers no harm and possibly rather enjoys the sensation of the impact, but the head of him who has the temerity to make the assault is often left bruised and bleeding, and the only sympathy he receives from the bystanders is the comment *"poor fool."* Nevertheless in the face of all this I propose to make one more vigorous *buck;* and if the shock to my cranium is more than it will bear, and I am laid low, no one will be to blame but myself.

I am not, however, Don Quixote like fighting wind-mills, but as I said a moment ago, I am attacking what appears to be an ingrained and unreasonable prejudice.

The word *prejudice* according to Webster means prejudgment: an unreasonable predilection for, or objection to anything; especially an opinion or leaning adverse to anything, without just grounds, or before sufficient knowledge, etc.

By the term *Persistent Chronic Apical Inflammation,* we mean those conditions of Apical disease which have been brought about by *sepsis.* Sepsis which has followed the death of the pulp and the putrifaction of this organ together with the 28% or more of organic matter left in the dentine.

The ordinary septic tooth is not now under discussion. We are dealing only with those teeth which for various reasons fail to respond to the ordinary, routine treatment generally employed by most dental practitioners.

These teeth have usually either a constricted root-canal, a crooked root, a broken broach in the canal, or a perforation in the side of the root, and as a sequel to these conditions, either a discharging sinus, a blind abscess, a granuloma or apical necrosis of greater or less extent.

These are among those conditions which have been the bane of the dental practitioner and have caused him many anxious, sleepless nights and much chagrin because of the persistency with which these teeth have resisted his best efforts to establish a cure.

There are two general systems employed in the treatment of Septic Teeth, one is Medical and the other Surgical.

We may group under the former, all those methods which have as their basic idea, the mechanical opening and cleansing of the pulp-chamber and the root canal, and the local application of such drugs as are deoderent and antiseptic in their actions, followed by mechanically sealing the pulp-canal and apical foramen, and any traumatism in the crown.

The latter comprehends all those procedures which are addressed to the surgical removal of the diseased tissue of the apical region, according to approved surgical principles.

The Medical aspect of the subject has been so thoroly and recently discussed by such eminent men as Callahan, Rhein, Ottolengui, Best, Buckley and others that we need not take your time to even review it. We will therefore present only the surgical side of the question, dealing first with the operation known as Apectomy *in situ,* the operation most generally employed today; with certain criticisms which seem to us to be well founded and of considerable importance.

Please bear in mind one important fact in the consideration of this subject. *Surgical treatment is indicated only in those cases* which resist the most careful, painstaking, intelligent, medical treatment.

That there are many cases which resist such treatment no one will deny, but because of this fact, it is *not* necessary, *not* a foregone conclusion, that these teeth must be lost.

The tendency today, by reason of the recognized possibility—that such teeth may endanger the health from focal infections—is to extract many teeth which, by a proper surgical precedure, might be rendered healthy and useful for an indefinite period.

Dental practitioners, we fear, have in many instances been stampeded by the cry of their medical brethren for the extraction of *all diseased teeth* regardless of the possibility that many of them are amenable to intelligent treatment.

There is just about as much sense in this as there would be, if they recommended the amputation of a foot or a leg to cure a suppurating, ingrowing toe-nail for fear of septic poisoning.

There is no doubt in any of our minds that many teeth have been crowned and bridged, that should, for the best interests of the patients, have been extracted. But please bear in mind again, that in most instances the practitioner who had performed this service, had lived up to his best lights; that he was doing the best that he knew how to do, was doing as well as the most of his conferees. Bear in mind again that much of this service was rendered before the discovery of the Roentgen ray, or to be more exact before the value of the Roentgenograph was realized or appreciated as an indispensible aid in the diagnosis of the abnormal conditions of pulpless teeth.

We cannot be too careful in our criticisms of pulp-canal operations, made before the general introduction of Roentgenology into dental practice.

It is very unwise "for a man who lives in a glass house, to throw stones at his neighbor's house." And this we fear is frequently being done by members of our own specialty.

There is nothing to my mind so unfair, or so uncharitable as the habit of speaking unkindly, in other words to use a slang phrase—as knocking a member of your own profession. We are, none of us, so great or so scientific as to be beyond the possibility of making a

mistake in diagnosis or an error in judgment.

With the introduction of Roentgenology into dental practice these dangers have been reduced to a minimum for him who employes this important aid to physical diagnosis.

SURGICAL PROCEDURES.

The surgical procedure usually practiced today is Apectomy *in situ.* (Amputation of the apex while the tooth is in its position).

The opening of the pulp-canal, its sterilization and filling is the work of the dentist, and must be, in this operation, performed before surgical interference is undertaken.

The diagnosis having been made of a chronic abscess, a crooked root, a broach in the canal, a blind abscess or a granuloma, and the operation determined upon, the patient's mouth should be cleansed by scaling the salivary deposits and polishing the teeth. This service should be rendered two or three days before the contemplated operation. Just before the operation the teeth should be carefully brushed and the mouth rinsed with a suitable antiseptic lotion.

TECHNIC OF THE OPERATION FOR APECTOMY *IN SITU.*

The operation should always be made under the influence of an anesthetic, either *general* or *local.* The selection of the anesthetic to be employed will depend upon the condition of the patient's general health and nervous stamina; and we would advise that the family physician be always consulted in this regard. If a general anesthetic is decided upon, secure, if you can, the services of the family physician as the anesthetist. If a local anesthetic is decided upon, his presence is also desirable, as it is always wise to divide the responsibility in all surgical cases.

For operation upon a single tooth, local anesthesia is usually sufficient, provided the patient has the proper nervous stamina and can be controlled. If more than one tooth is to be operated upon a general anesthetic will be best.

The patient being ready for the operation, the gum over the area of the intended operation should be painted with the following solution:

Iodine (crystals), 1. gramme.
Glycerol, 4 c. c.

The instruments necessary for the operation are:—

1 Dental Engine.
1 Small Bistory.
2 Artery Forceps.
1 Dressing Forceps.
2 Small Bone Chisels, 1 flat, 1 gouge.
2 Small Bone Burs.
1 Trephine (¼ to ⅜ inch).
2 Small Curets, 1 straight, 1 curved.
1 Small Spring Wound Retractor.
1 Silver Probe.
1 Lead Mallet.
1 Spear-pointed Drill.
2 Small Dentate Fissure Burs.
2 Marginal Trimmers (file cut).
1 Small Periosteotome.
1 Curved Scissors (curved on the flat).
2 Small Curved Needles.
1 Needle Holder.
6 Silk Ligatures.
6 Black Horse-hair Sutures.
1 Small Bone Nippers (straight).

It of course goes without saying, all instruments, ligatures and sutures must be sterilized by boiling.

It is not likely that all of these instruments will be used in any one operation, but they should be at hand, ready for use in case of need.

The first step in the operation is to lift the soft tissues from the bone over the apex of the tooth. This may be done either by a straight incision following the long axis of the tooth, or by a curved flap incision over the apex of the tooth.

The incision should be carried down to the bone and the soft tissues including the periosteum lifted from the bone with the periosteotome.

The retractor is now introduced to hold the soft tissues out of the way.

The bone over the apex is then removed, either with the bone chisels, the bone burs or the trephine.

The diseased area being now exposed, the apex of the tooth and the surrounding tissues should be carefully examined as to the character and extent of the disease. The apex of the root will usually be found to be more or less extensively denuded of its pericementum, and the surrounding cancellated bone in a carious condition.

In the case of a chronic discharging or blind abscess, a cavity of greater or less extent will be found to surround the apex of the root. This abscess cavity is lined with, what used to be called a *pyogenic membrane,* the old idea being that it secreted pus. This membrane, however, is nothing more or less than a defensive barrier formed by an army of soldier leucocytes who have hastened to attack the invading army of enemy micro-organisms and confine them to that particular location by surrounding them with fortifications difficult to pass.

The next step in the operation is the amputation of the diseased apex. (When using the trephine this instrument removes the apex with the button of bone and fully exposes the apical area).

Amputation should not extend beyond the denuded portion. The extent of the denudation being determined by the removal of the bone over the apex by bone chisels or burs, make an opening thru the center of the apex at a point nearest to the intact membrane with the spear-pointed drill, then with a dentate fissure bur cut mesially and distally until the apex is severed. Amputation may be done in some cases with the trephine as just indicated, or with a pair of small bone-nippers.

Next, with the marginal files or trimmers, remove any sharp edges upon the stump, being sure to leave a smooth, rounded end. Then with the curets remove all diseased soft tissue or soft and carious bone and wash out the debris with sterile water, using a syringe or irrigating apparatus for the purpose.

Lastly bring the edges of the wound in the soft tissues together and unite them with the horse-hair sutures.

We believe it is better practice, in a majority of cases to close the wound at once, rather than to keep it open with surgical packing as is usually advocated and practiced by most operators.

The blood-clot which will form in the cavity is a better dressing for the wound than any foreign substance that can be introduced as a surgical dressing.

Ordinarily such a wound will heal in from a week to ten days, while if allowed to remain open and packed with surgical dressing, it will take from four to six weeks for the wound to close.

The old idea that all such wounds must be closed by the slow process of granulation still abscesses in the mind of many of us. A blood-clot is soon organized into new tissues, if you have not reinfected the wound and it is left undisturbed. Notice for instance how seldom suppuration follows the extraction of a tooth even for an acute dento-alveolar abscess. The blood-clot formed in the alveolus, protects against reinfection in a large majority of cases.

Your essayist became convinced of this principle many years ago and began closing clean wounds of the face and mouth without drainage as far back as 1887.

The disadvantages which pertain to the operation of Apectomy in situ, are: *First.* The great difficulty or perfectly sealing the apical foramen, by any method so far devised, *in situ.* It goes without saying that a more perfect root-canal operation can be made upon a tooth that you can hold in your hand than upon one that is buried in its alveolus and out of sight, that the diseased apex can be more readily and perfectly treated when you can see every part of it and if you so desire examine it with a lens. *Second.* The operation is practically con-

fined to the anterior teeth. *Third.* It can not be employed in those cases—with safety—where the apex of the diseased tooth lies in close proximity to the floor of the nasal fossa or the floor of the antrus of the Highmore or the inferior dental canal. *Fourth.* It can only in exceptional cases be employed in multi-rooted teeth.

Fifth. By the employment of surgical packing reinfection from the oral secretions is very liable to occur, and this would greatly retard the healing process and possibly endanger the success of the operation.

With this *plain* and I believe, *fair* statement of the advantages and disadvantages of the Operation of Apectomy *in situ* permit me to place before you in the same manner the Operation of *Apectomy AB SITU.*

This operation, as the term implies, is made upon a tooth which has been removed from its normal location. In other words it is extraction and replantation after the tooth has been treated while out of the mouth.

This operation applies particularly to those teeth which have open pulp-canals, teeth which almost immediately show signs of inflammation upon the canals being sealed, even with a temporary dressing, teeth which tax the skill of the operator and the patience and courage of the sufferer, sometimes to the breaking point and in desperation he demands the extraction of the offender.

This particular form of pericemental irritability we believe is due to certain saprophitic anaerobic micro-organisms, principally the *pulpae grangrenosae* of Arkovy, which attack the dead or gangrenous tissue left in the pulp-canal and the dental tubuli: (The 28% or more of organic matter remaining in the dentine). As a result of this decomposition. ptomains, and gases are formed in the pulp-canal and the dental tubuli. These ptomains and gases are not only forced into the apical area where acute inflammatory symptoms are induced, but they percolate thru the dentine and cementum, setting up more or less acute symptoms of pericementitis. These poisons are also taken up by the lymphatics and emptied into the blood stream and thus carried all over the body producing rheumatism, neuralgias, neuritis, endocarditis myocarditis, neuristhenia and a long train of other ills.

This being the fact the complete sterilization of the tooth (pulp-canal and dentine) is the only means that will prevent a recurrence of the inflammatory symptoms.

These are the conditions which he was experimenting with formo-cresol. But you know and I know, that even this remedy often fails to render these teeth sterile and that they are later lost.

The operation of Apectomy *ab situ* now comes to our aid, and if performed with reasonable care to asepsis a very large majority of these teeth can be saved and be made useful members of the dental economy.

Teeth, however, which have been crowned are not suitable cases for this operation, because of the danger of injuring or breaking the artificial crown in extracting the tooth; aside from this, the operation is just as applicable to these teeth as to any others.

With very few exceptions any tooth in the mouth may be treated by this surgical method. About the only exceptions are those just mentioned, and superior molars with divergent roots; while occasionally a lower molar with convergent roots might have to be excluded.

The X-ray will settle this question for you.

The instruments required for this operation are many less than those necessary for the first named operation and can be found in any well equipped dental office.

INSTRUMENTS REQUIRED.

1 Dental Engine.
1 pair of Forceps.
2 Curets, 1 straight, 1 curved.
1 one-half inch Carborundum Stone.
1 Spear-pointed Drill.
2 Round Burs.

TECHNIC OF THE OPERATION.

Previous to the operation an impression is taken of the region to be operated upon, which must include the diseased tooth and at least one on either side, mesially and distally, from which a metal cast must be made. Upon this a splint is constructed of thin gold plate or aluminum and then carefully burnished to position and ready to be cemented in place as soon as the operation is completed.

Considerable care must be exercised in the extraction of the tooth, not to bruise the enamel or fracture the crown. The best way to avoid such an accident is to place a piece of softened modeling compound upon the inside of the jaws of the forceps and while still soft apply the instrument to the tooth. This gives a perfect impression of the crown and will with proper care prevent all injury from extraction.

Before extracting the tooth, thoroly paint the gum, labially and lingually with the iodine solution just mentioned.

As soon as the tooth is removed place it in a solution of Mercuric chloride 1 to 500 of water, which has been previously heated to a temperature of 103°F. and so maintained. The tooth should be allowed to remain in this solution for a period of 5 to 10 minutes or even longer.

During this time the diseased apical area of the alveolus may be curetted and irrigated with the warm mercuric chloride solution and then packed with sterile gauze.

The tooth is now removed from the mercuric solution, wrapped in a piece of sterile gauze moistened in the solution, the pulp-chamber opened thru the crown and the root-canal thoroly cleansed thruout its entire length.

The diseased portion of the apex is amputated at this time, being sure to cut no farther than the line of denudation of the pericementum. This is important, as it is thru this membrane that the vital connection is reestablished.

The apical foramen should now be enlarged and given a relentive shaping suitable for a gold filling. The same should be done with the opening or cavity in the crown.

The pulp-canal should next be thoroly irrigated with the mercuric solution by forcing it thru with a syringe, and then again placed in the solution for at least 10 to 15 minutes to complete the sterilization.

The root-canal after proper dehydration is filled with chlora-percha and gutta-percha points, and the openings in the apex and the crown filled with gold and carefully finished. A piece of pure gold wire may be driven into the apical foramen instead of placing a gold filling if so desired.

Great care must be observed in finishing the gold filling or the bold wire in the apical foramen.

Roughness of the root apex from any cause will retard the healing process.

Before replanting the tooth it should again be placed in the mercuric solution for another 5 to 10 minutes to insure against infection from the handling, after which the packing is removed from the alveolus, the tooth replanted and the splint cemented into place.

If the technic outlined has been carefully followed there will be no post-operative pain or soreness.

The only after treatment necessary is the employment of a 25% solution of 12 volumn hydrogen peroxide as a mouth wash.

Apectomy *ab situ* has in my hand proved eminently successful and I believe it to be the operation *par excellence* for this class of cases.

NOTES ON CONDUCTIVE ANESTHESIA.

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(Read at the Sixty-first Annual Meeting of the Michigan State Dental Society at Detroit, Mich., April, 1917.)

CONDUCTIVE anesthesia in contra-distinction to other methods introduced of late years, has fulfilled all claims made in its favor.

When I returned from Europe in the fall of 1912, I was repeatedly ridiculed on account of statements which I made about this anesthesia. Many things were said, disapproving and disfavoring its value and efficiency by men, who in a very superficial way, had heard or read about this subject.

The tide has turned. Conductive anesthesia is in general use all over the country by the best practitioners and its merits appreciated highly. Of course accidents will happen, but if they do, only in the hands of those practitioners who do not care and do not take the time to study the subject before practicing it on their patients.

In my own hands this method has given excellent results. Tho occasionally an injection had to be repeated, there has never been an accident not even as much as syncope. In many thousand injections there was never a needle broken.

Only because I believe in the extreme usefulness of this method, I again write on the same subject.

My remarks will be few, but important.

The anesthetic still in general use is novocain. For the last five years the E tablet of the Farbwerke Hoechst Co. containing each 0.02 gram novocain and 0.00005 gram suprarenin was employed both in the hospital and in my private practice exclusively.

I shall try to describe in a few words the preparation of the 2% solution. The novocain tablet dissolver which you all know, is filled with about 5cc. of Sterile normal saline solution and brought to the boiling point. The syringe which was kept in a glycerine-alcohol solution (70% alcohol 700 parts, glycerine 300 parts), is cleaned by drawing the hot saline into its barrel, emptying it and repeating this until all the solution is used up.

Now the cup is filled again up to a little above the 3cc. mark and again allowed to boil. Three E tablets are thrown into this solution and dissolved by heating. The novocain solution drawn into the syringe is now ready to be injected when reaching body temperature. The steel needle and hub are removed from the sterilizer and attached to the syringe.

There is no objection on my part to using Rinber's tablets instead of normal saline, but my experience with the latter has been so satisfactory that I continue employing it. The hypodermic syringe of Freienstein has given practically perfect results as have the two kinds of steel needles: No. 1 (0.90 mm. in diameter), 40 mm. long for mandibular injections, and No. 17 (0.47 mm. in

diameter), 42 mm. long for all other anesthesias.

During the last few weeks we have on trial at the hospital, a syringe designed by Dr. Riethmueller who was kind enough to give me the following description:

"It holds 2½ c. c. In its design, delicacy and lightness have been prime considerations. It is an all glass and metal syringe without washers of any kind, which for purposes of sterilization is taken apart in two sections. The glass and metal are annealed in such a way as to permit of vigorous prolonged boiling. All gnarled corrugated surfaces are avoided, and all corners are rounded off and the piston is made to end in a graceful indented end in which the ball of the thumb fits snugly. The cross-bar moves readily and the barrel is long enough so that the operator's second and third fingers find ample working space between cross bar and cheek so as not to obscure the field of vision. Altho very light pressure only is required in conductive anesthesia, the syringe is tested to 60 lbs. pressure so as to allow of infiltration without regurgation. To prevent the migration of a broken needle into deeper strata of tissue, the needles have been provided with a safety disc, wider than the lumen of the needle perforation, so that the needle fragment is automatically arrested. Since, according to the laws of mechanics, the needle, no matter whether of steel or iridio-platinum, must break at the orifice of the hub to which the needle is attached, the risk of "losing" a needle is eliminated, which fact may be especially appreciated by the beginner. To facilitate finding the inclination of the bevel of the needle, a mark is placed on the hexagonal hub in such a way that visibility of the mark indicates pointing of the bevel of the needle toward the bone. To avoid confusion the hubs of steel needles are nickel-plated, those of iridio-platinum are gold-plated."

So far both syringe and needles have stood the test. It seems that the needle bends at the distal part of the disc and repeated straightening may weaken it considerably. The syringe is smaller and lighter than the so-called Fischer syringe. It is very easily handled and satisfactory in every way. We hope that unimportant defects which may be found at any time, will be simple to remedy.

In regard to mandibular injection, I unfortunately cannot report any improvement. The technic is as follows: In injecting for the right side, the left index finger is placed upon the lower fold and pushed backward until the finger tip comes in contact with the external oblique line. Then it is moved up on that line until the finger is about level with the occlusal surfaces of the lower teeth. The finger tip is so turned, that the finger nail will come in contact with the internal oblique line, while the finger ball rests in the retromolar triangle. The finger nail is then retracted from the internal oblique line to make room for the needle to go 1 cm. above the occlusal surfaces of the lower teeth thru the soft tissues right against the internal oblique line. Retracting the needle slightly, so as to release it from the periosteum, move mesially and backward to pass the internal oblique line where three or four drops are deposited to anesthetize the lingual nerve. The needle point at this time is not in contact with the bone (inner aspect of the ascending ramus); to reach the bone the syringe, which up to now was in nearly sagittal direction, is moved towards the opposite side until the point of the needle comes in contact with the bone again. The needle should now proceed backward alongside the bone until 2 cm. of its length have disappeared in the soft tissue. We have now reached the region of the inferior dental nerve where we deposit the remainder of the solution (about 1½ c. c.) To inject the left man-

dibular region, the syringe is held in the left hand.

The mental injection is not as useful as the mandibular, being employed mostly to complete mandibular anesthesia of the opposite side over the median line or, desensitize that part of the lower jaw which lies anterior to both mental foramina.

An infraorbital injection includes the anesthesia of the first bicuspid in practically all cases, of the second, in a small percentage. A discussion of the superior dental branches in another part of the paper will explain this. The method of injecting is quite simple.

With the left index finger we palpate for the infraorbital foramen which lies a little less than 1 cm. below the middle of the inferior orbital margin. With the thumb of the same hand, the upper lip is held upward and outward. The needle point is inserted slightly posterior to the apex of the cuspid tooth, not into the fold, but slightly away towards the lip, so as not to come in contact with the bone too soon. Then the needle is directed up thru the soft tissue to the foramen, where 2 c. c. of the anesthetizing solution are deposited. The palatal side must be injected separately if more than operative dental work is contemplated.

The injection at the maxillary tuberosity has brought forward more discussion and created more misunderstanding than any other subject pertaining to conductive anesthesia. It is hoped that Dr. Riethmueller's technic, while not nearly perfect at the present time, will, in the near future, give us that longed for method which, if successful, will include the anesthesia of not only the second but also the first bicuspid.

Having the opportunity of seeing the doctor work at my clinic in the New York Throat, Nose and Lung Hospital, I am in a position to watch with greatest interest and hopes, the outcome of this study.

Below I am giving Dr. Riethmueller's summary on this question.

"Reports concerning the extent of anesthesia produced by tuberosity injection seem to vary as widely as the opinions of anatomists regarding the course of the superior middle alveolo-dental branch. This branch, if it exists—and some anatomists claim it does not—may present the following variations in course. It is either given off from the large infraorbital branch within the infraorbital canal and runs from there in the mucosa of the maxillary antrum to the upper bicuspids without appearing upon the facial surface of the maxillary bone; or it is inserted together with the posterior branch at the cribriform plate; or it is inserted in foramina situated anteriorly thereto. The examination of numerous skulls and clinical observations tend to point out that the latter two conditions are present in at least seventy-five per cent. of cases. If the long needle is inserted in the reflection of the mucous membrane back of the distal root of the first molar, in other words, between first and second molars, and advanced on the bony surface, without discharging solution in an upward, backward and inward direction at an angle of about 45° with the masticating surfaces of the upper molars, and 1½ c. c. of solution are injected when the needle has been introduced to full length; if then in slowly withdrawing 1 c. c. of solution is discharged as the needle is withdrawn, thus leaving a deposit of solution from the cribriform plate to the reflection of the mucous membrane; then, the three molars and two bicuspids together with the soft tissues connected therewith are satisfactorily anesthetized. It is of little practical value to argue how this anesthesia is obtained. Suffice it to say that either the posterior and middle branches are blocked simultaneously at the cribriform plate or, if the middle branch is inserted in its own foramina anteriorly

to the cribriform plate, it is blocked there as the needle is withdrawn, or if the middle branch descends within the antrum, enough solution penetrates the canaliculi in the cortical facial bone to produce bicuspid anesthesia. If the first bicuspid is only partly anesthetized, as happens in some cases, this is due to the anastomosing fibres of the anterior branch. Most operators seem to insert the needle too far posteriorly and at too obtuse an angle, thus getting way beyond the cribriform plate, and yet not deeply enough into the spheno-maxillary fissure to block the maxillary branch in toto. Stern's suggestion of using the long needle in the bayonet-shaped hub has not given any better satisfaction. In all cases where the operator attempts an injection at a very obtuse angle a great deal of his solution seems to be deposited in the very heavy layer of areolar tissue overlying the cribriform plate and filling the spheno-maxillary fissure, so that very little solution is left for the nerve branches to conduct. This will also explain the observation of some operators who obtain only partial anesthesia of the first molar."

To simplify matters, I consider it very important to review the nerve supply of the maxilla. Therefore, I cite the following paragraphs from one of my previous papers:

"For conductive anesthesia in the upper jaw, two nerve loops must be taken into consideration, the outer of which is formed by a part of the maxillary division of the fifth cranial nerve and its termination, the infraorbital, and their branches: the posterior, middle and anterior superior dental nerves. The posterior superior dental branches enter the bone thru the posterior dental foramina (foramina alveolaria) at the tuberosity (tuber maxillae); the middle superior springs from the infraorbital nerve in the posterior part of the infraorbital canal, and the anterior superior branches just posteriorily to the infraorbital foramen. The above-mentioned nerve loop supplies the bone and all the teeth of the corresponding half jaw, the mucous membrane of the maxillary sinus and the buccal periosteum and gum tissue. The infraorbital nerve—after leaving the foramen—distributes branches to the lower eyelid, the side of the nose and the moveable part of the septal cartilage (alae nasi and septum mobile nasi), and skin and mucous membrane of one-half of the upper lip. At the tuberosity are two to three posterior dental foramina at a distance of one to two cm. about the alveolar border. The infraorbital foramen is situated about seven mm. below the center of the lower orbital margin.

The inner nerve loop also originates from the maxillary division of the fifth cranial nerve, but thru the medium of the spheno-palatine ganglion, which receives it motor (great superficial petrosal nerve of the seventh cranial n.) and sympathetic (great deep petrosal nerve of the cartoid plexus) roots from the Vidian nerve; the great superficial petrosal and great deep petrosal nerves join to form the Vidian. The anterior palatine nerve (of the descending branches of this ganglion) making its appearance upon the palate thru the anterior palatine foramen and the naso-palatine (of the internal branches) coming thru the incisive foramen are the two components of the inner nerve loop. It supplies the hard palate of one side and the soft tissues covering it. The anterior palatine foramen will be found one-half cm. to the palatal side of the alveolar border of the first, second or third molar depending upon the age of the patient. The incisive foramen occupies a position eight mm. behind the alveolar process between the two central incisors in the median line. This opening is very easily reached, because it lies behind and above the incisive papilla.

To anesthetize the nerves at the tu-

berosity, we hold the lip and cheek away with the index finger of the left hand and tell the patient to partly close his mouth; then we take the syringe with the right hand, pierce the mucous membrane at a point corresponding to the middle of the distobuccal root of the second molar and continuously injecting while the needle is in the tissues—proceed in the direction above the apex of the third molar until about two cm. of the needle disappear; stay in contact, with the bone and deposit two c. c. of the solution. In children, and in cases where the third molar has not erupted, always use the last molar and the one next to the last as guides.

While the nerve supply of the maxilla, as given above, may be considered normal, it must nevertheless be of great interest to the practitioner to review the different descriptions by the most prominent anatomists and also the more common variations in the distribution of these nerves; thus we should find an explanation of the variation in the extent of the area anesthetized by the same method in different patients or the failure to produce anesthesia.

Piersol, in his anatomy, states "that in absence of the buccal branch of the fifth, the posterior superior dental has been observed to be of large size and to assume the distribution of the buccal.

The middle superior dental nerve occasionally arises from the anterior superior dental.

The anterior superior dental nerve is the largest of the three superior dental nerves." They all help to form the superior dental plexus.

"Two thickenings are sometimes found in the superior dental plexus. One of these, known as the ganglion of Valentin, lies above the tip of the root of the second premolar tooth, at the junction of the middle and posterior superior dental nerves; and the other, sometimes called the ganglion of Bochdalek, is situated more anteriorily, at the junction of the middle and anterior dental nerves. Neither of these enlargements is a true ganglion, being without nerve-cells and consisting of interlacing bundles of nerve-fibers."

Gray gives the following description: "The posterior superior dental branches enter the posterior dental canals on the zygomatic surface of the maxilla, and passing from behind forward in the substance of the bone, communicate with the middle dental nerve by a plexus formation, and give off branches to the lining membrane of the antrum and three twigs to each molar tooth. These twigs enter the foramina at the apices of the fangs and supply the pulp."

"The middle superior dental branch is given off from the superior maxillary nerve in the back part of the infraorbital canal and runs downward and forward in a special canal in the outer wall of the antrum to supply the two bicuspid teeth. It communicates with the posterior and anterior dental branches by a plexus formation (plexus dentalis superior)."

In Cunningham's text-book of anatomy the superior dental nerves are somewhat differently distributed: "Rami alveolares superiores posteriores (posterior superior alveolar nerves, which may be double) descend thru the pterygo-maxillary fissure to the lateral side of the maxilla, and proceed forward along the alveolar artery. They supply the gum and the upper molar teeth by branches which perforate the bone to reach the alveoli. The nerves form a fine plexus joined by the middle alveolar nerve before finally reaching the teeth."

"In the infraorbital canal the infraorbital nerve supplies one and sometimes two branches to the teeth—the middle and anterior superior alveolar nerves (ramus alveolaris superior medius et rami alveolares superiores anteriores). The former may be only a secondary branch of the latter nerves,

or they may arise independently from the infraorbital nerve. However formed, the nerves descend in bony canals in the wall of the maxillary sinus (to the lining of which branches are given), and reach the alveolar arch, when they form minute plexuses and supply the teeth (joining posteriorily with the branches of the posterior superior alveolar nerve). The anterior superior alveolar supplies the incisor and canine teeth; the middle superior alveolar nerve the pre-molar teeth.

Spalteholz describes the ramus alveolaris superior medium as being given off in the posterior part of the infraorbital canal, while the corresponding illustration shows it to branch off before the maxillary nerve enters the canal.

According to Zuckerwandl, only the posterior ond anterior superior dental nerves are constantly present, the former supplying the molar teeth. The middle branch—if present—innervates the bicuspid teeth.

In studying carefully the different descriptions of the nerve supply of the maxilla, we must necessarily come to the conclusion that the teeth are not innervated by the posterior, middle and anterior superior dental branches directly, but thru the medium of the superior dental plexus. The middle branch—according to Zuckergandl and Cunningham—is mostly present in a certain percentage of cases; it often is a part of the anterior, which is always the largest nerve of the three.

The ganglion of Valentin, situated above the tip of the root of the second premolar tooth, gives evidence of an anastomosis between posterior and middle nerves and accounts for the number of failures to anesthetize the first molar region by a tuberosity injection. With an infraorbital anesthesia we very often reach the first bicuspid, but I never could include the second (ganglion of Bochdalek). In some instances a tuberosity and infraorbital injection will still leave the region of the bicuspid sensitive, which can only be explained—assuming the injection has been properly given—by a large middle branch given off in the infraorbital canal. Both bicuspids will, under normal conditions, never be anesthetized with a tuberosity injection, unless large quantities of the solution are deposited and driven up and around the maxillary nerve before it enters the infraorbital canal, which would be equal to a blocking of the second division. Even if the posterior and middle branches enter the bone at the tuberosity and we there anesthetize both, the first bicuspid will remain sensitive on account of the anastomosis of the anterior and middle nerves. Local injection (infiltration) must be recommended for operative work on the bicuspid teeth with the exception of infected cases."

Dr. Riethmueller's statement that "it is of little practical value to argue how this anesthesia is obtained," must be contradicted. If an anesthesia is successful, our first thought must be how the same is accomplished, anatomically and physiologically.

The most important fact then, in regard to the superior dental branches is, that the greatest authority, Zuckerhandl, describes only two branches, the larger anterior which includes normally the middle branch, and the smaller posterior nerve. Piersol and Cunningham admit the frequency of the above distribution.

It is comparatively simple to understand from the above, the impossibility of anesthetizing the bicuspids in the average case by means of conductive anesthesia at the tuberosity of the maxilla.

If occasionally we do get an anesthesia of the bicuspids, it must be due to the blocking of the main second branch or to an abnormal distribution of the superior dental branches.

For Dr. Riethmueller's method, I would give the following explanation:

The depositing of 1½ c. c. at the highest point which the needle reaches at the tuberosity, may and does at times anesthetize the main second division of the fifth cranial nerve in that region. Furthermore, the infiltration of this whole area from the highest point to the lowest, which lies above the first molar, possibly effects the inclusion of the second bicuspid.

The anesthesia of even the first bicuspid, which is claimed to occur at times, proves the above statement, because we all know that even tho the first bicuspid were not supplied by the anterior superior dental branches alone, it could not be anesthetized entirely if the so-called middle and anterior branch give it its nerve supply.

The fact that the infraorbital injection practically always reaches the first bicuspid and in a small number of cases even the second, shows the correctness of Zuckerkandl's anatomical description of this region. Why should it be a rare exception that the bicuspid region remains sensitive after an infraorbital and tuberosity injection as outlined by myself above? Only because it is a rare exception for a middle superior dental branch to be given off in the infraorbital canal. If two distinct branches enter the bone at the tuberosity, they are both posterior branches and not posterior and middle. The partial anesthesia of the first molar after the tuberosity injection, which occasionally occurs, is in my experience not due to faulty method but to an anastomosis of anterior and posterior branches in that region. It may also be mentioned at this time that the results of Dr. Riethmueller's injection are not nearly as successful as the infraorbital or mandibular.

We have also noted that even tho the bicuspids were anesthetized, the palatal side was still sensitive, showing that the spheno-palatine ganglion lying posterior to where the solution is deposited, is not infiltrated; but at the same time not excluding the blocking of the main second division, anterior to the ganglion.

Apart from the above points under discussion, conductive anesthesia is still indispensible and THE method of anesthesia in dental and oral surgery. With the improvement of the dentist as to asepsis, knowledge of anatomy, pathology, etc., with the simplifying of preparation of the solution and the methods of injection, conductive anesthesia is accessible to everybody.

Experience shows that only an extremely small number of patients are exempt from its application. Only the other day, a patient came under my care with the advice from an extraction specialist in our city, not to take anything but gas for surgical treatment. I gave her an infraorbital injection, extracted a cuspid tooth and curetted the apical region thru a buccal incision without any trouble. There is practically no condition under which conductive anesthesia, if carefully employed, will not be successful, but we have to remember that the needle must not pass thru infected tissues. Let us not forget that this method is not the only one and a general anesthetic must be employed whenever indicated, even tho only in a comparatively small number of cases.

PATHOLOGY OF WAR SURGERY WITH REFERENCE TO ITS RELATION TO DISEASES OF THE MOUTH.*

TETANUS, GAS-PHLEGMON, SEPTIC AFFECTIONS.

By Leo Eloesser, M. D., San Francisco, Assistant Clinical Professor of Surgery, Medical Department, Stanford University.

(Read before the San Francisco Section of the Preparedness League of American Dentists, May 1st, 1917.)

THE pathology of tetanus, gas-phlegmon and the various septic affections of the mouth does not differ essentially from that of sepsis in other parts of the body. My experience with the dental aspects of these disorders is limited; however, sepsis and its treatment is the one great problem of military surgery, one which everyone who has worked in a military hospital has had abundant opportunity for studying.

Tetanus—lockjaw—is caused by a spore-bearing organism first discovered by Nicolaier and Kitasato. It is anaerobic, growing only under exclusion of oxygen. The bacilli themselves are not difficult to destroy; the spores are exceedingly resistant; steaming them for an hour or more may not kill them. This is important; the usual ten minutes' sterilization will not do for materials that have been used in a case of tetanus. Two hours is none too much. The bacilli and their spores are found in the excrements of men and animals, and in the soil, especially soil which has been under cultivation and has been manured frequently. The moist damp soil of the tropics seems especially favorable to their growth, but the fields of France, too, cultivated and fertilized with manure for centuries, have given rise to so many cases of lockjaw that it is the custom of doctors in certain localities to give every patient sustaining an accidental injury a prophylactic injection of antitetanus serum. This contamination of the soil may serve as a guide in knowing where and when to watch for tetanus; it explains its seasonal prevalence during the warm months after the soil has been freshly covered with manure, and explains why tetanus is so very much more common after wounds of the lower extremity than after any other. The trousers and particularly the shafts of the soldiers' long boots are covered with earth and mud and contaminated with tetanus bacilli.

The germ does not grow in the presence of oxygen. Hence, wide open wounds rarely lead to lockjaw. The deep, closed, infected tracts that follow gunshot wounds are particularly fitted for the growth of tetanus.

Tetanus infection is spoken of as a true toxemia. Perhaps this is not strictly so, as we shall see later; at any rate, the body is not overwhelmed by the germs themselves, but is poisoned by substances elaborated by them. The germs stay in the wound and do not travel either into the blood or into the lymph stream. They

*This is the first of three lectures on Military Dental Surgery, and the other two will appear in later issues of The Journal. The subject of the second paper is "Gunshot Wounds and Lesions Produced by Shell and Shrapnel in the Jaws and Face," while the third is on "Plastic Surgery of the Jaws and Face. Bone Grafting in the Jaws."

produce an exceedingly active poison, which has peculiar chemical affinity for certain cells of the central nervous system on which it acts much like strychnine. The poison reaches the cells of the spinal cord thru the nerve sheaths, not thru the blood. Hence the infection cannot strictly be termed a toxemia, i. e., a *blood* poisoning. Once anchored to the cells of the spinal cord it enters into so firm a combination with them that we know of no substance which can cause it to loose its hold. It is therefore much easier to catch it before it has reached the spinal cord than it is to counteract its effects afterwards. It is the poison of the bacillus, and not the bacillus itself that does the harm. If tetanus is uncomplicated by other infections it may not even make the wound suppurate; and if we counteract the poisons a wound may harbor tetanus bacilli indefinitely without causing symptoms. This explains the cases of late tetanus so-called, or the cases in which a man who has received prophylactic injection of antitetanus serum immediately after his injury may seem perfectly well and show not the least sign of lockjaw until months afterwards, when perhaps, an operation is undertaken which sets a new wound, disturbs the tetanus bacilli in the old scar and the immunity from the former injection of serum having given out, the man suddenly, a few days after this last operation, breaks out with a violent attack of tetanus.

Tetanus has been much more common in this war than in any other, especially on the western battlefield. In our own Civil War we had about 2½ cases of tetanus to the thousand of wounded. In the Franco-Prussian War of 1870 about 3½. In this war there have been 6 to 7 cases both on the French and on the German sides. This horrible frequency, which in the early stages of the war, when the supply of antitoxin was insufficient, almost reached the proportions of an epidemic, soon fell when both armies made it a practice to inoculate every wounded man with serum as soon as possible after injury.

It is rather anomalous to take much of your time in discussing tetanus because it so rarely follows wounds of the face and jaws. Of 166 cases about ⅔ occurred after wounds of the lower extremity, a little less than ⅓ after wounds of the upper, and only five, that is to say 3%, after wounds of the head. There were no cases observed after wounds of the lung, which again indicates that the bacillus cannot grow in well-oxygenated tissues. If the frequency in the early stages of the war was appalling, some comfort may be derived from the fact that about one-third to one-half of the affected men recovered. In our Civil War 90% of them died. The figures for home hospitals and field hospitals are very different. The earlier the signs of tetanus show themselves after injury, the worse is the outlook for the patient. The bacillus probably always enters the wound in the form of spores and it takes a certain incubation time for enough of these to sprout and to elaborate sufficient poison to cause the clinical picture of lockjaw. If the incubation time is ten days or less, the outlook for recovery is poor; if it is over ten days half to two thirds of the men get well. As the early and severer cases show themselves at the field hospitals the late and lighter ones in the home territory, the statistics of the field hospital have the heavier mortality.

The clinical picture varies somewhat with the severity of the case, but there are two signs that appearing early will draw attention to danger: the first is a difficulty in opening the jaws or in swallowing, due to a cramp of the masseters or of the muscles of the pharynx;—the sign that gives the disease its name—the second is a cramp or twitching in the muscles in the neighborhood of the wound. Either of the two may appear first; the local twitching in the periphe-

ral muscles is less generally known. It may, however, precede the trismus and should excite grave suspicion in cases of gunshot wound. The trismus or difficulty in swallowing has often been mistaken for a tonsillitis or some other innocent affection. The trismus or the localized spasm may last for a day or two without any further development, and without a change in pulse rate or temperature. Usually, however, the spasm becomes more general, the lockjaw more intense, and the lips are curved in a characteristic grin—the "sardonic smile." The temperature rises a few degrees. The senses are not benumbed, they are more acute than usual, the men have a frightened stare in their eyes, their minds are abnormally alert and active; the ordinary light of day and the usual noises of the hospital and street, closing of doors, rumbling of wagons, become painful to their eyes and ears. As the disease progresses spasm succeeds spasm, and the unfortunate man is seized by rigors that arch his back and throw him up high in bed—opisthotonos. The slightest stimulus suffices to bring on a cramp—a spoken word, a jarring of the bed, a heavy footstep. The diaphragm and the intercostal muscles are attacked, the glottis is closed in spasm, the man lies gasping, choking, frothing at the mouth, fighting for his breath. The temperature reaches great heights, 106, 107, 108, and the man dies, either choked to death by a spasm of the glottis or killed by an aspiration bronchopneumonia. The rigor goes over directly into the rigor of death; the temperature continues to rise for one-half hour or more afterwards.

I have tried to picture to you a severe case. In the milder ones that go on to recovery, the symptoms are less severe, the spasm less general. Still in most cases of generalized tetanus, trismus, a certain stiffness, at least, of all the muscles, and a hypersensitiveness of the senses are not wanting. As trismus and spasm are the first to appear, so they are the last to go; the masseters and the gait may be stiff for many weeks after the onset of the disease.

The wound itself may show no signs of the nature of the infection. We have seen that the bacilli of themselves do not cause suppuration; an innocent-looking punctured wound of the foot, stepping on a nail for instance, may lead to fatal lockjaw. Tetanic gunshot wounds, however, are almost always infected with all kinds of organisms, other anaerobes, and especially streptococci, and they do have one characteristic which I have not seen mentioned in the textbooks—one that should excite suspicion—that is painfulness. The surface of a week-old wound is ordinarily not very painful to the touch, but tetanic wound-surfaces are. The men wince or cry out with pain whenever the wound is touched—even in the gentlest manner. There are no granulations; the wound is grey, covered with sloughs or at times with a thick yellowish croupous membrane. The membrane sticks fast; if one tries to peel it off the wound bleeds. At times the wound is covered by a scab, and under the scab are a few drops of blood-stained pus.

These are the ordinary cases of tetanus, but some variations occur. One of them, local tetanus, a lighter form, is not infrequently seen of late, since all the wounded have been getting their serum early. The spasm is confined to the muscles adjacent to the wound; a leg alone, or an arm may be affected, be stiff and seized by exceedingly painful tonic cramps; but the jaws may be quite freely movable. The men have no fever; the general condition may be good. This lighter form usually has a long incubation period of several weeks.

Another form, an exceedingly grave one, should interest you particularly—head tetanus—first described by Rose in 1870. This follows only after wounds of the head; the facial spasms, lockjaw,

and cramp of the muscles of deglutition are particularly pronounced, but the rest of the body may not be spastic. There is often a palsy of the facial nerve on the side of the injury; the mouth, instead of contracting in a sardonic grin, pouts over to the healthy side, the eyelids on the healthy side twitch, those on the affected side droop. The severity of the lockjaw and the cramp of the glottis is such that many patients with head-tetanus die. Still Rose cites the case of a coachman who ran a splinter from a broken whip into his jaw and who recovered, and there is a chronic form in which recovery is the rule.

The diagnosis of well-developed tetanus is easy. It is the incipient symptoms that are difficult to recognize or to interpret, but it is just these that are of importance. Once the disease is well on its course there is little we can do to stop it. The main thing is to watch for the early signs, to know that they do occur and not to pass lightly by a man who complains of a slight stiffness in his jaws or twitching in a group of muscles, not to think that he is "nervous" or has a sore throat, and pay no heed to his complaint. It is in the very earliest stages that treatment offers the best prospect of cure. If in doubt, treat the man as tho he had tetanus.

Treatment of outspoken cases, we said, is not efficient. Prevention is the best treatment, and failing prevention, treatment before the disease has actually appeared—as early as possible.

Prevention is not feasible under many of the exigencies of war, certainly not in the mud and filth of the West front trenches. Still the Japanese did a good deal towards prevention in their war with Russia. They made their men bathe as often as practicable, especially before a battle, and they had light uniforms which were more easily kept clean than the heavy ones of felt or wool. Especially dangerous as tetanus carriers are the high boots, puttees and leggins worn by some of the combatant troops. However, if one cannot clean the man, one can usually clean his wound if one gets it early enough—clean it by cutting away jagged and mangled bits of muscle and fat and skin and by extracting leather and felt and foreign bodies when they can be gotten at easily without too much boring about in the wound.

And finally, if one can clean neither man nor wound, one can always furnish him with protection against the tetanus germs which he may harbor. This protection against lockjaw is one of the great triumphs of modern medicine. In 1891 v. Behring found that mice injected with a lethal quantity of the poison taken from the bodies of tetanus bacilli, would not die if they were at the same time injected with serum from a horse who had been previously treated with small amounts of tetanus poison—antitetanus serum, or tetanus antitoxin. And so it is with men. A man whose wound harbors tetanus bacilli will not ordinarily develop tetanus if he is injected with this antitoxin *early* and *soon,* as soon as possible after he has been wounded, and before the tetanus spores have had time to sprout out into bacilli, before the poison from the bacilli has traveled up the nerves and anchored itself to the cells in the spinal cord, the cells which it irritates to a state of tetanic convulsion, the cells to which it binds itself so firmly that we know of nothing powerful enough to make it loose its hold—before, then, the clinical signs of tetanus, the lockjaw, have made their appearance. The value of this early antitoxin injection had been demonstrated irrefutably before the present war. The war made the proof still more convincing. Bazy took 200 wounded; 100 of them received no prophylactic treatment, of these 18 developed tetanus; the other 100 received a prophylactic injection, none of them developed tetanus. Where all the men received treatment 0.4% developed teta-

nus; when merely suspicious cases were injected 1.28%—or three times as many.

What are "suspicious" cases? Every case is suspicious, and every wounded man should get an immunizing injection of antitoxin as soon as possible.

It has been objected that tetanus develops sometimes in spite of an immunizing injection. When there is an overwhelming rush of wounded after a battle it is difficult to keep proper track of the records, and a man may pass as immunized who in reality has not been injected. Or the injection may come too late, or the man may harbor such an immense number of germs or the bacilli be so virulent that the injected dose is too small. Again the immunity from a single injection does not last as long as was first supposed—probably not over 2-3 weeks, and if the man continues to carry tetanus after the effect of his antitoxin wears off, lockjaw may, of course, assert itself. And finally, even tho some men may develop tetanus in spite of their antitoxin prophylaxis, the proportion of recoveries is greater and the disease often runs a milder and an atypical course.

The dose of antitoxin necessary to immunize is not great—1500 units is what is usually given.

Happy as are the results of prevention and prophylactic immunity, so deplorable are the results of treatment of the developed disease. Once the poison has reached the cord, there is nothing we can do to break it loose—more may be attained perhaps, by symptomatic treatment, by stopping the convulsions as far as possible, and making it possible for the man to breathe until he has had time to overcome his infection.

Whether antitoxin is of any benefit once lockjaw has set in, is a question. If it is to be of any use at all one must give enormous doses, hundreds of thousands of units. The poison does not travel by the blood stream, it travels up the nerves. And so the antitoxin should be introduced along the nerves, injected into the nerve sheaths, or directly into the spinal canal or the brain by spinal or ventricular puncture. As the quantity which one can introduce in this way is limited, these injections may be supplemented by injections into the veins or beneath the skin. Personally, I have seen no benefit from the antitoxin in the treatment of the active disease; others, however, have, and in deference to current opinion, I should advise its being given. Very large doses are necessary, 30-50,000 units a day are not too much. Continued over too long a time, 6 days or over, it is decidedly dangerous. There is a risk of the man going into a sudden collapse from anaphylactic shock after an injection.

Jesionek has recommended exposing the men to the ultra-violet ray, the quartz lamp. The ray does not kill the bacilli, but it does destroy the poison; tetanus toxin exposed to the ray loses its poisonous properties. So that the treatment seems not unreasonable.

Salvarsan has been recommended—I fail to see on what grounds.

Symptomatic treatment offers some promise.

In the first place every sound or jar or footstep is not only painful to the patient's highly strung senses, but sends him off into a fresh convulsion. He must be kept absolutely quiet—in a darkened room, if possible. The nurse should touch him or the bedclothes only when unavoidably necessary. Good nursing means leaving the man alone. Of drugs a solution of 2.5—3% magnesium sulphate made up with normal salt and allowed to flow continuously into a vein is praised as allaying the spasms and producing a general anesthesia. Kocher injects a 10 cc. of 15% mag. sulph. into the spinal canal. Spinal puncture is difficult in tetanus patients, it usually requires an anesthetic and the drug is dangerous when introduced into the spine. Meltzer gives a little ether together with the magn. sulph. and reduces the dose of

magnesium to ¼ of what would be required without the ether. Others have recommended glycero-phosphate of magn. as being less dangerous than the sulphate.

Other sleep-producing drugs besides magnesium are useful. Hot baths may reduce the spasm. Chloral is widely used; drugs that reduce the blood-pressure less, luminal, for instance, is better, I think. Morphine is usually given; the old fashioned tincture of opium is preferable if the man can be gotten to swallow it; if not it may be given by rectum or injected subcutaneously in the form of pantopon.

The convulsions may follow with such rapidity and severity that an anesthetic is necessary. A little chloroform is better than ether. Pneumonia is the gravest danger for these men, and ether is irritating to their lungs.

Finally, Sauerbruch has cut the phrenic nerves in order to set the diaphragm at rest. Some have recommended tracheotomy for those choking with a spasm of the glottis; others a gastrostomy, sewing a tube passed thru the belly wall into the stomach for purposes of feeding.

Feeding the men is a problem. They cannot swallow, or if they can they are in great danger of aspirating. It is a good plan to try them with water first. It is not so bad to aspirate sterile water as it is other kinds of food. Passing a stomach tube is difficult, it may be necessary to remove two teeth or to pass the tube thru the nose in order to get it into the pharynx at all. If one passes a tube one should make sure that it really is in the stomach and not in the lung, and should pass the food into it slowly. If the man gags or vomits he is liable to aspirate and drown in his own vomitus. Rectal feeding, water and glucose, given by a drip enema help, but are not sufficient to sustain life for a great length of time. The best plan is to give the man mg. sulph. and if this controls the spasm, even temporarily, to administer all the food possible while the cramps are in abeyance.

When one sees the poor fellows one cannot help having the idea that it is not the tetanus poison that kills them, but the choking and starvation, and the pneumonia that follow on both. One cannot help thinking that if one were only able to abate their convulsions long enough to let them breathe and swallow that they would get over their disease by themselves. That is why the symptomatic treatment does seem of some use.

To put it into practical form, I should advise giving the antitoxin intraneurally, intravenously, intraspinally too, if it can be done without an anesthetic,—30-50,000 units per day for 2-3 days, then 20,000 or so for 2-3 days longer; besides this 2.5% magn. sulphate in normal salt solution in a continuous intravenous flow, allowing 50-150 cc. to flow for about two minutes (the proper dose for each patient should be tried out), repeating the dose every hour or two. The needle may be left in place if care is taken not to scratch the wall of the vein with it. Luminal 0.5 and tincture of opium m. xx should be given three times a day, by rectum if necessary. Feeding should be done during the period of magnesium relaxation by tube if need be; and above all the patients should be kept absolutely quiet. Make the nurse let them alone.

This war has brought out much that is new, it has also unearthed much that is old—gas gangrene, gas phlegmon, hospital gangrene—these were names before the war, merely names. One read about them in the textbooks, especially the old ones, mused over them in descriptions of old hospitals; but the interest they had was merely historical; one thought about them as about the horrors of the Tartar invasion. But today they mean more—unforgetable pictures of suffering.

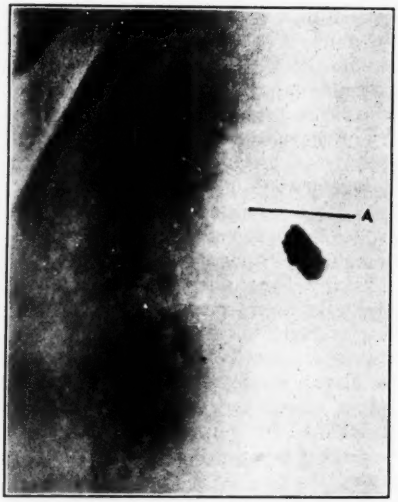
Gas phlegmon, gas gangrene, malignant edema are diseases whose clinical

aspect is better known than their bacteriology. The effect of these infections may vary somewhat—some have more gas formation, some more gangrene; in others the edema is the salient feature; but all of them concur in rapidity of extension, violence and gravity. Weinberg of Paris, who has done much work on the subject describes four bacteria, all anaerobes, that can cause gaseous phlegmon and malignant edema. The wounds are rarely infected by one bacterium alone, smears from the secretion usually show a most variegated mixture. The germs are all anaerobes, dwellers in the soil, and in all sorts of filth, excrement, manure, and decaying cadavers. The battle-fields of France are impregnated with them.

Commonest is the gas bacillus of Welch, bac. aerogenus capsulatus, often called bac. perfringens in France and England. It causes a rapidly swelling infiltrate full of minute bubbles of gas, and gangrene of the affected tissues. Two factors seem to be necessary for the development of the disease, contamination of the wound with the bacterium is not sufficient. It seems that the germ needs dead tissue to gain an ascendency, dead tissue and the exclusion of oxygen. Most gunshot wounds, of course, offer these conditions, there is scarcely a bullet or a shell wound but what is surrounded by large amounts of dead muscle and blood clot. Wounds of the vessels where the blood supply to a considerable part of the limb is cut off and where the limb suddenly becomes gangrenous are particularly favorable to the development of gas phlegmons. Once the germ has gained the upper hand it spreads rapidly, its spread causes the death of further amounts of tissue and so we have a vicious circle set up. It differs from tetanus in that it by no means confines itself to the wound; it travels with amazing rapidity both by the lymph and the blood stream, and at autopsy we find the bacilli swarming thru all the organs, the spleen, the liver, the heartblood,—often in such numbers that the chambers of the heart are full of gas, and the liver and spleen are spongy with gas developed in them by the bacilli almost immediately after death. Death results then not only from the formation of toxins in the wound, but from an exaggerated bacteremia.

The appearance of the wounds is characteristic; the muscles are gray and

Figure 1.



X-ray of gas abscess around fragment of shell in thigh. A, gas abscess.

dingy; they are bloated and swollen; they pout thru the hole in the skin from the pressure underneath and from the wound exudes a thin bloody serum, or a thin gray pus. The pus does not stink, it is not putrid, but has an ammoniacal smell something like foul urine. The affected part is enormously distended, dusky, mottled blue or purplish brown, somewhat elastic, but very hard, like a well inflated tire, and covered with large bloody blebs. If one presses one can feel the gas crackle under one's fingers; when percussed or scraped with the back of a knife the part sounds hollow. One can even see gas under the X-ray, it

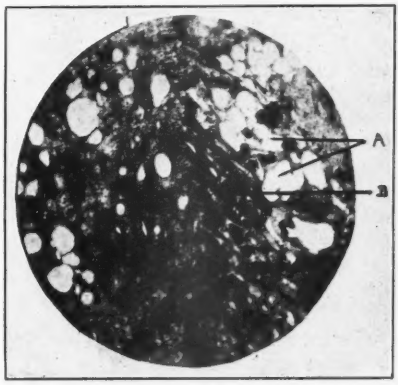
often gives a light area around the bone. The appearance of the part, the duskiness and the tension are caused by development of gas bubbles thruout the muscles. If one incises their sheaths they burst out like the inner tube from a cut tire casing. Once the tension is relieved they are soft, flabby, grayish, anemic, and full of collapsed bubbles. The limb is cold, the veins are compressed by the enormous inner pressure, some of them are clogged with clot, others merely squeezed together,—at any rate they are more or less closed to the circulation. The affected parts are exceedingly tender and painful.

It usually takes a few days for the phlegmon to develop unless there is a wound of the vessels which immediately cuts off the blood from an extensive area, and sets large masses of necrosis free to invasion by the bacilli. However, once the process has begun, its further course is extremely rapid. One can see the phlegmon spread hour by hour, the duskiness and swelling travel and the general condition become more and more grave.

Undue pain in the wounded part and an increasingly rapid pulse give the first signals of danger. As in tetanus, the patients' minds remain clear to the last; they are often preter-naturally alert, and often happy and unaware of the gravity of their state. The temperature is not much increased at first. Towards the last it raises rapidly to 104-5 or more; the pulse stands higher on the chart than the temperature. The poison affects the heart and the patients finally succumb to heart failure. The pulse becomes more rapid, 120, 140, 200; weaker and weaker, the blood pressure falls; the men are blue and cold, sweat profusely, their respiration is rapid and shallow. It is the heart, however, that fails first and not the breathing as in tetanus. Death is often so sudden that one thinks of an embolism,—the man suddenly becomes cyanotic, collapses and sinks over dead. At autopsy the heart and its coronary vessels frequently contain gas, even when the cadaver is examined so soon after death that a post-mortem development of gas is scarcely possible. These bubbles may be the cause of gas embolism.

Not all the men die, modern treatment has enabled two-thirds of them to recover. Recovery in the mild cases comes almost as quickly as death in the bad ones. Under free incisions the swellings rapidly recede, huge masses of necrotic fat, fascia and muscle drop off,

Figure 2.



Necrotic muscle containing bubbles of gas (A). Muscle fibres (B).

yellow pus pours from the wounds, their surfaces rapidly cover with large pink granulations; the temperature and pulse drop and the men get well.

As in tetanus, the wounds may long harbor the dangerous organisms. Re-operations, attempts at complicated plastics or transplantations, and operations which traumatize tissue and cause necrosis are risky; many a man has recovered from his primary gas-phlegmon to die of a late recurrence following reoperation. Even the simplest procedures are usually followed by fever and much inflammation of the wounds.

This is the first form of gas-phlegmon caused by the gas-bacillus of Welch. Another bacterium, bacillus ede-

matiens, Weinberg calls it, makes a similar infection. The general picture of heart failure, bacteremia, prostration and rapidity of extension is the same. But the character of the wound is a little different. There is little, if any, gas, but in its stead an amber-colored or a greenish gelatinous edema soaking the limb. It is especially copious about the veins, and travels up along them in a remarkably short time; one may find it at the groin half a day or less after it has begun to show at the leg or ankle. Crepitation is absent; the wounded parts are paler, more copper colored or livid, often covered with large blood blisters; otherwise the infection looks like that of the gas-bacillus.

Still another malignant anaerobe is the bacillus of malignant edema, the "vibrion septique." This makes chiefly an edema, very little gas, the skin is sometimes pale, sometimes covered with blisters, sometimes dark blue; the whole wounded part is soaked with watery edema which spreads with great rapidity. If the infection is uncomplicated by other bacteria the wound may have no offensive odor.

The clinical course of the disease is the same as in the two preceding. The "vibrion septique" seems comparatively rare; but four cases out of a hundred malignant phlegmons investigated by Weinberg harbored this germ.

The fourth and last of these organisms, the bacillus sporogenes differs greatly from the three others that we have been discussing. It is also an anaerobe, is a spore bearer, and in the smear looks exceedingly like tetanus, but it does not cause a typical phlegmon. It does not spread nearly as rapidly, it does not affect the heart, and does not make the men nearly as sick. It makes big localized abscesses—not progredient phlegmons, but localized walled-off abscesses—big abscesses and a most pestilential stench. They develop quickly enough, but much more slowly than the malignant phlegmon, make a collection of pus and gas the size of a soup plate sometimes; one slits them open, and that is all there is to the matter. They heal. The skin over such an abscess may be reddened, more often its color is scarcely changed, the part is somewhat painful, but not nearly as tender as with a gas phlegmon. Their feel is characteristic; one can feel the pus and gas swashing around in them like air and fluid in a half full rubber hot water bottle. Tapping them with the finger makes a sound like tapping on the inflated cheek.

I have spent considerable time on these malignant infections because they are frequent in the European hospitals—they make from 1 to 2% of all wounded—and because our first hand knowledge of them has come almost entirely from this present war. One should surely learn to recognize them, still I doubt whether I should have discussed them at such length before a dental society. The face, head and jaws are about the only places in the body where they do *not* occur. They are, like tetanus, frequent in the lower extremities, frequent about the buttocks and genitals, not infrequent in the back and abdominal wall, and even in the upper extremity. But there they stop. I never heard of a gas phlegmon of the neck or of the face and jaws. The face and mouth are probably so well-nourished that the tissue necrosis which is needed for the establishment of a gas phlegmon or malignant edema is wanting.

These malignant infections are rarely or never unmixed, they swarm with all kinds of bacteria, harmful and innocent, especially with streptococci and staphylococci. With these we again begin to tread on better known ground. Streptococcic and staphylococcic infections in soldiers do not differ from those in civilians, except for their frequency. Especially frequent are streptococcic infections. One finds streptococci everywhere, in almost all wounds, and finds

all kinds of clinical forms, abscesses, phlegmons, brawny infiltrates, erysipelas, and lymphangitides. Abscesses are perhaps less frequent about the mouth than brawny streptococcic infiltrates, thick, swollen cheeks, periostitides, and phlegmons. They do occur, however, in the floor of the mouth, and under the deep fascia of the neck as an extension from infections of the mouth, jaws and tonsils. They first show themselves as thick, hard, doughy, somewhat but not excessively tender swellings running down along the front edge of the sterno-cleido-mastoid. They do not often fluctuate, they are too deep and too tense. They should be incised without waiting for fluctuation. A small incision across the front of the sterno-cleido-mastoid with a soft rubber drain is sufficient, a large incision is unnecessary. The abscess heals readily once the pus is let out. Other streptococcic infections, infiltrates behind the jaw, and periostitides I need not discuss; you have seen more of them than I have. The streptococcic infections that one sees in Europe are not so bad; the men usually get over them pretty readily; they are certainly less to be feared than the deep staphylococcic infections. They are not nearly so prone to make metastatic abscesses, pyemia, abscesses of the lung, etc.

The staphylococcus is a dangerous germ. One sees enough staphylococcic disorders about the mouth and jaws. Staphylococcus osteomyelitis of the jaw is occasionally met with. The jaw and cheek are hugely swollen, hot and tender, there is high fever and delirium, the men are dangerously ill. The mandibular vessels are often plugged by septic clots, a big piece of the jaw bone becomes necrotic, and if the man lives long enough, is sequestrated. The jaw should be chiseled wide open thru a long incision along the border of the chin as soon as the condition is recognized. The marrow will be found to be full of yellow pus. The incision should be kept open by a drain of rubber dam until the sequestrum is shed; often enough there will be recurrences as further sequestrated bits of bone work their way out.

Equally dangerous is a staphylococcic parotitis. This is occasionally met with in the course of a tetanus. The gland is encased and interwoven with a tough fascia which holds the separate lobules firmly together. Pus in the gland is under great pressure; there is not one large abscess, but a multitude of small ones; the whole face and cheek are swollen and exceedingly tender. The inflammation soon extends beyond the gland and into the neck under the superficial fascia. Here too, one rarely finds one large abscess, but small collections of pus surrounded by a hard, dense infiltrate scattered thruout the fat. One is loath to operate on account of the danger to the facial nerve, but incise one must. The nerve enters the gland from the inside and behind. If one lays back the skin and fascia in a large superficial flap and then opens the gland by spreading the points of a blunt Mayo scissors, one may avoid the nerve. The neck should be freely incised and the infiltrate opened by incisions parallel to the surface of the skin until sound tissue is reached. The operation is a formidable and bloody procedure, but small incisions, even crucial cuts thru the infiltrate are insufficient. The proper form of dissection will lay open an extensive crop of small yellow points of pus, miliary abscesses. Under proper treatment the inflammation soon recedes, the swelling abates and the flaps fall back into place of their own accord.

I once caused a parotitis and phlegmon of this kind by passing a probe into an old salivary fistula following a wound of the neck and jaws. The next day the man had a temperature of 105. His head and neck were swollen to the size of a watermelon and only the freest incisions saved him.

Besides these "surgical" infections there occur others—superficial ones,

thrush and diphtheritic and croupous infections that one sees in medical hospitals, mainly among soldiers wasted by disease or by the wear of hard campaigning. I have had no experience with them.

A few words on bacterial activity, resistence, and the surgical treatment of infectious disorders in general.

On first working in a military hospital every one is struck by the men's recuperative powers, especially surgeons coming from civil charity hospitals where they have to do with a worn-out, whiskey-soaked, decrepit clientele. It must be remembered that in working with soldiers we are working with sick men it is true, but not with men who are wasted by a long course of a variety of chronic ailments; we are working with men who prior to their wound, were the flower of the land, strong, hearty, seasoned by a simple out-door existence, eating coarse, wholesome food, and free from alcohol—for all of the combatants have barred strong liquor. It is not to be wondered at that soldiers can overcome infections which would carry most of the unfortunates in our municipal hospitals to a quick grave.

As to treatment in general, dressings, etc., I can be short. It really doesn't matter. There are a few good rules to remember:

Drainage is of little value; make the incision such that you don't have to drain, so that there is nowhere to put a drain, so that there is nothing *to* drain. Cut away what is dead or rotten or liable to become so, if you can do it without injuring important nerves; the vessels in the head are of less importance, one can tie almost any of them without much damage.

Know the anatomy, know it well. Know what to avoid, know how to place the incision so that it may not leave an unsightly scar. Kocher's textbook is invaluable here.

Know what are to be the sequels of what you are to do; an incautious incision may ruin the chances for a future reparative plastic.

Treat the tissues with respect; do not bruise or mangle them nor bore about in them. Make up your mind beforehand what you are likely to find and what you may have to do, and do it directly and neatly and cleanly.

Carry the operation thru, then leave the patient and his inflamed tissues alone long enough for them to get well. One can often avoid a repetition of operations by doing the first one properly and with due foresight for what is to come.

As to dressings,—they do not matter much, at any rate none except the first. The great maxim for the first dressing is "nil nocere"—Do no harm! Do not infect places that are not infected already by poking gauze or your fingers or other things into them. I have had no experience with the Carrel irrigation in fresh wounds. It is difficult to carry out and requires more help and attention than a military hospital can ordinarily afford, but seems good according to all accounts, if done right. This too, is really a first dressing. After the first few days, after the wounds have begun to granulate, dressings count for very little. Dry dressings or moist ones, boric acid solutions, normal salt, water, salves, or no dressing at all, they will all do. The only things not to use are irritating antiseptics, bichloride compresses and such things.

Ambroise Paré was a military surgeon, and one of the greatest doctors that ever lived. He knew, and what he said of his wounded is true now as it was 400 years ago:

"Je le pansay, Dieu le guerit." "I dressed him, God cured him."

THE FILLING OF ROOT CANALS.—THE MOST VITAL OPERATION A DENTIST PERFORMS.

By David Wield McLean, Mt. Vernon, N. Y.

(Read before New Hampshire State Dental Society, June 20, 21, 22, 1917.)

NO MAN engaged in the practice of dentistry today can look about him without feeling proud of his profession. No one of us can view the progress made in operative procedure, in the devising of prosthetic appliances which shall be useful, artistic *and clean,* or in orthodontia and oral hygiene as aids to better development of the child and the evolving of a better race, but he must thrill with enthusiasm. No one of us can see the wonderful truths unearthed by our research workers and the boundless curative possibilities they are opening before us; or feel the growing respect of the medical fraternity and the world at large, but he must be glad to be identified with such a body of men.

There is, however, one sobering thought which obtrudes itself. Our greater knowledge carries with it greater responsibility—our greater comprehension of the requirements carries with it a demand for greater percision of technic—for heartbreaking effort to meet the growing exactions of our work.

Our research workers in discovering the instrumentality of the blind abscess and the pyorrhea pocket in causing arthritis, endocarditis, nephritis, myositis, etc., have brought home a tremendous indictment against *us.* For *we* are the cause of much pyorrhea, and nearly all of the blind abscesses. It hurts—but we might as well look the facts in the face.

The standard of root canal work has changed. It is no longer sufficient that a tooth should remain comfortable, that no fistulous opening should proclaim the presence of a chronic abscess. The so-called blind abscess or Granuloma or Pericementoma has come to take the joy out of life—and it has succeeded quite well. It is no longer correct to mumify half devitalized pulps, even if the patient is nervous or does not want to pay for a correct operation, or even, as is more commonly the case, if the dentist is pressed for time. The successful root canal filling must preserve the periapical tissues from infection.

Would that I could burn into the conscience of every dentist in the country the legend "The filling of root canals is the most vital operation you perform." Fail in introducing a filling, and you lose the filling; fail in introducing a crown and you may lose the tooth—and the patient. But fail in filling a root canal and your failure may result in lasting ill health and misery to your patient, and may in the most inciduous way strike years from his life.

Barring war and taxes, the most prevalent thing in the world today is faulty root canal work. Everywhere you turn it stares at you—every discolored incisor, every gold or porcelain crown you see suggests a half filled root canal and a blind abscess. You think this rather pessimistic? Listen:

Otto U. King, Secretary of the National Dental Association, stated recently—"If a man isn't worried about his root canal work today, it doesn't mean that there is nothing the matter with his

root canal work—it means that there *is* something the matter with *him.*"

In New York City last winter, Dr. Bissell A. Palmer stated: "The man who isn't using the X-ray, and considers his root canal work satisfactory, is living in a fool's paradise." He also stated that approximately 80% of all malpractice suits in connection with dentistry arose directly or indirectly from faulty root canal work.

Any radiologist will tell you that whether they be in third molars or central incisors, the root canal fillings in his pictures are almost universally bad.

I used to think, as we are all apt to, that this state of affairs was due to carelessness, and that my own root canal work was better. For the last three or four years I have had an X-ray machine within a few feet of my chair, and I am a wiser and sadder man today. I know that my root canal work used to be wretched and that it is still very bad.

One of the hardest things on earth to do is to ream and completely fill root canals.

H. M. Haskins, M. D., stated: "The surgeon who is operating for appendicitis has a snap compared with the dentist who is reaming and filling root canals." M. L. Rheim, of New York City, who can certainly fill root canals if anyone can, stated that he had recently sent two patients to a specialist for the removal of two teeth *which he had been reaming for weeks without being able to perfectly fill.*

In a recent paper Dr. E. C. Rosenow states, "I do not presume to pass judgment as to whether root canals can or cannot be properly filled. In some cases it is mechanically impossible. To devitalize teeth is therefore dangerous, even in the hands of the most skilled."

We must realize then that filling root canals is not a simple operation to be "thrown in" with a filling and to be accomplished in a few minutes. In a definite percentage of cases the canals are such that they cannot be perfectly filled —when they can be, it is a difficult operation, and a luxury for the patient. Patients should be educated to these facts and taught that the answer is oral hygiene—frequent examination—in other words, the prevention of these major operations.

Two questions are inevitably linked with the consideration of root canal fillings. The first is—how shall we devitalize the pulp, in order to maintain the periapical tissues in as nearly as possible their normal condition. When the pulp is removed, two things will happen —the blood supply to the periapical membrane will be lessened—and secondly, scar tissue will result at the point where the pulp is torn away from the membrane. Both of these things mean lowering resistance to bacterial invasion, and a certain decrease of resistance is therefore unavoidable.

This condition may be greatly aggravated by injudicious medication. When a trace of arsenious acid is placed in contact or proximity with the pulp, that organ may die half way to the apical foramin or to the foramin or beyond it. Arsenic is the most penetrating of tissue poisons. We all know that when it leaks out of the cavity and reaches the gum, there is no telling how far the gum, pericementus and bone will die. Tell me, then, when we place it near or on the pulp of a tooth, how are we going to know how far beyond the root end its effects will reach? Doubtless the periapical tissues are often completely destroyed before the canal is ever filled. There is a growing distrust of arsenic, and the day is coming when it will be little used, if used at all.

Very often the infection at the root end is hematogenous—reaching there, not thru the canal, but by means of the blood stream. Price has gotten cultures from the pulps and periapical tissues in pulpitis, when the pulp was not even exposed. Rosenow injected infection se-

cured from the dead pulp of a tooth into twenty-four animals and in 50% of them *produced dental pulpitis.* Pulpitis of sound teeth is probably often caused by infection carried to the pulp by the blood stream, and it is feasible that infection is frequently thus carried also to the periapical tissues of devitalized teeth —which fall an easy prey *because of their lowered resistance.* A perfect root canal filling aseptically introduced might thus be followed by a granuloma.

The writer has frequently used Buckley desensitizing Paste to devitalize the pulp in the apical halves of canals where arsenic would have been unsafe, and has in several cases noticed distinct lesions in radiographs taken to check up the root canal filling. I believe this procedure to be unsafe—a sufficient quantity of formaldehyd gas is liberated to destroy the tissues beyond the apical foramin. Dr. Callahan objects to the use of sodium and potassium in cleansing canals for the same reason.

Probably the least harmful method of pulp treatment is pressure anesthesia—provided always that every precaution is taken not to force infection thru the apical foramen. The cavity should first be curetted as thoroly as possible and painted with iodine. Where the pulp is not exposed the high pressure cocaine syringe is indicated as the other method is painful and inefficient unless applied to the pulp direct; after exposing the pulp, cocaine, novocaine or neurocain is used with pressure.

The other preliminary question deals with infected teeth—which ones shall we save, and which remove? This is the most trying question before the conscientious dentist today—because it carries great responsibility with it, and because six different authorities would answer it six different ways.

There is at present an epidemic of indiscriminate extraction of teeth—probably 80% to 90% of which could be saved. Price has stated that periapical infection as a rule cannot be removed except by surgical means; that he has secured cultures by asperating the ends of roots previously infected, after they had been treated by ionization or otherwise, and perfectly filled for a day, a week or several months.

This is very plausible. We must remember that the cementum covering the root is a structure similar to bone, that its lacunau and canaliculi contain living tissue nourished largely if not entirely by the circulation of the pericementum. If then the pericementum is detached from the tooth either by pyorrhea or apical abscess, the cells in the lacunac of the cementum die and the cementum itself becomes a dead and pus-soaked tissue. How then can we expect living tissue to reattach to it? Even tho the radiograph may show a regrowth of healthy bone how can we be sure of the complete eradication of infection? Price has stated that if a dressing even of pure formalin be placed in a canal which has caused periapical infection and has been under treatment, a culture can be obtained from the apical end of the cotton in a few days.

It is exceedingly difficult for the busy practitioner to check up these statements for himself. The writer has tried to do so in a few important cases, with the following results:

Case 1. Two molars, showing lesions in radiographs. History of rheumatism. After reaming thru apices, patient suffered violent reaction in joints thruout the body. Teeth treated for several weeks with formocresol (Buckley). Dressings were then left in the six canals for two weeks, and were carefully removed and the apical thirds of all six clipped off and dropped in broth. No growth in three days. The teeth were saved.

Case II. Neurasthenia. Upper first bicuspid—pericementoma. Treated in the same manner. No growth in three days. Tooth saved. Two other teeth

gave cultures of hemolyzing streptococcus and were removed.

Case III. Slight heart valve lesion and myositis of left side of neck and shoulder. Patient had acquired the habit of carrying the head tipped to the left side. A lower bicuspid, pericementoma which had become acute. Drained thru canal and treated with formocresol until acute symptoms had subsided. Then dressed with formocresol and left for two months. Then cultured from cotton —report streptococcus viridans. Same report from pyorrhea pocket of another tooth. In view of the patient's susceptibility to streptococcal infection, teeth were removed and sockets curetted. Twenty-four hours after the bicuspid was removed the patient felt as if "coming down with la-grippe"— ached in every joint and felt "sick all over." His throat then became sore and he spent two days in bed. Physician first pronounced it tonsillitis. There was no fever, however, and symptoms disappeared in two or three days. The physician then pronounced it rheumatic sore throat and agreed that it all came as a result of the removal of the teeth. Two days later the patient's neck and shoulder stiffened up and became so painful that he could not turn over in bed or put on his coat without help.

Case IV. Arthritis. Two bicuspids. Treated formocresol for several weeks, canals filled, bismuth-iodoform-formocresol paste, checked up with X-ray, refilled, checked up again and found O. K. Violent negative phase after reaming apices. Patient did not improve materially. Made cultures from crypts of tonsils—report negative. Finally reamed out the canal filling, passed a sterile Kerr broach thru the foramin and drew it across agar slants. Reports streptococcus hemolyticus. Teeth were removed *and sockets curetted.* Severe rheumatic symptoms after removal of teeth.

It would not be safe to base deduction on these few cases, but they coincide with the experience of other men. We can sometimes cure these infections and sometimes we cannot. If the patient is free from heart, joint or kidney trouble, anemia or nerve derangements, the removal of the teeth is not necessary. Where such conditions are present the teeth should be cultured and if pathogenic organisms are present, removed.

As Dr. Morehead expressed it at the New York State meeting last month—"Let us keep our feet on the ground, and our heads in the air, and look the facts squarely in the face."

Let us be abreast of the Times, but *don't* let us be hysterical.

In considering the technic of filling root canals, or of any surgical operation, the first topic is Asepsis. A whole paper could be written on this phase of the subject alone, as Dr. Callahan proved very recently; his exhaustive study on this subject leaves nothing more to be said.

First—It goes without saying that every root canal instrument should be sterilized before being used. The most certain method is by steam under pressure at a temperature of 125° centigrade for fifteen minutes. However, an instrument that has been boiled five minutes may be relied on *provided* that it has not lain in the cabinet for a day or two after being boiled—in which case it will have become reinfected from the air. Lysol and other solutions are not desirable because they are "smelly" and because in very few offices will they be renewed and cared for as they should be. The formaldehyd vapor sterilizer is a delusion and a snare for the same reason. Not one in a hundred is kept efficient—Callahan states that a temperature of 68° C. and 60% of humidity are necessary to do this. There must also be plenty of the drug, frequently renewed. Do not think these sterilizers are effective as long as you can get a whiff of formaldehyd on opening the door, and do not expect the germs to die of

fright when they see the big gold letters "STERILIZER" on the glass door.

We must bear in mind that in infected root canals we are constantly dealing with not only pyogenic bacteria, but the most deadly pathogenic types. We must also bear in mind that if we allow these to be carried to another canal on our instruments, we are infecting *not merely the canal but the patient.* We are introducing into that patient's system a strain of streptococcus with which he will battle for the rest of his life and which in the end may be his undoing. If an instrument touches a neighboring tooth or the patient's lip, or is laid on an unsterilized table, it is again infected. In fact, if you finger it, it is again infected. Callahan proved that after scouring and scouring his hands they still gave luxuriant growths on agar plates. When they were finally sterilized fairly well, he worked for ten minutes and again touched his finger tips to agar plates and got a most disheartening growth. If your fingers touch the patient's face and then the broach, that broach is once more thickly populated.

Then there are our paper absorbant points which are sterilized at the factory but which should be sterilized again before being opened because the box has become infected thru handling. And the gutta percha points, which Callahan rightly claims should be sterilized by steam or hot air before being used. Do you dry root canals with a wisp of cotton rolled from the cotton holder on your chair table? It has been standing exposed to the air for hours and Dr. Callahan on opening an agar plate to the air of his office for ten minutes got a growth of several varieties of strep. If you have draperies and carpets in your office and throw cotton used to dry cavities on the floor, you can probably get a culture in one minute. Do you dry canals with the hot air syringe? One blast on an agar plate gave Callahan more varieties than Heinze ever dreamed of. Boil the chip blower frequently or use an electric hot air syringe, the air from which is sterilized by passing over a red hot coil.

Secondly—A sterile field of operation is essential. All debris should be drilled and washed from the cavity before the canals are opened. The cavity and adjoining teeth should be sterilized with Iothion or 70% alcohol (which is better than 95%) or equal parts of H_2O_2 and a 1 to 500 solution of bichloride of mercury.

The saliva should be excluded. This is especially important since Rosenow has demonstrated the transmutability of the streptococcus-pneumococcus group. If the pneumococcus may become a viridans or a hemolyticus, then it behooves us to exclude the saliva, since it practically always contains pneumococci.

The rubber dam is a hardship to the patient, and the writer never uses it if he can avoid it. We must admit, however, that it is the surest means of excluding infection—it has an added advantage in that we may wash it with alcohol after it is in situ—and we cannot so wash the patient's mouth, lips and face. There is a special Ivory clamp for broken down roots—or some operators cement a ready-made Blue Island Brand band to the root and then apply the dam. Before using these do not forget to inject a few drops of novocaine solution.

Access to the canals is very important. How often we find that the amalgam marking the opening thru which the root canals of a molar were half filled is no larger than a pin-head! How often we find that front tooth is opened (and just barely opened) close the gum on the lingual surface—it is impossible to cleanse the chamber and canals unless they can all be seen and reached. The root canal operation is the most important thing you will do to the tooth; a perfect canal filling is worth sacrificing a little tooth structure for. All overhanging structures should be removed and

the cavity walls be continuous with those of the chamber. The largest possible size round bur, sharp, is the nicest thing with which to open the chamber of a half devitalized tooth. A small one may plunge in while a large one used without forcing will cut a small opening without entering the chamber.

When the chamber is opened the mouth lamp is lit—no matter how light the office may be, a mouth lamp is indispensible in locating the canal orifices. Any who cannot secure electricity should use a small battery lamp. A very convenient one is the Sancy lamp made by the Nevo Manufacturing Company, New York City.

When the canals are located, the first instrument to be used is the smallest size "Young" broach, with short handle. This broach is extremely fine, very flexible and not brittle. I have seen them twist up into variable corkscrews without breaking. They will follow any bend, and have not sufficient thread to lock or to remove the pulp before we are ready to do so. By the time the apex is reached with this, the operator has a good idea of the canal—whether it is curved, how far down, and in what direction. This broach is followed by the next larger, and the next, after which the Gates Gliddon drill in the contra angle handpiece is used for just a few revolutions, to enlarge the orifice of the canal. They should never be used beyond the orifice—they are not flexible enough. If there is a curve they may drill a little notch in the side of the canal, and thereafter no instrument will turn that curve. Too large a Kerr broach used at the outset may cause the same trouble. Three sizes of the drills are used, after which the orifice is so large that instruments will not bind there. In adult teeth there is usually a marked constriction at the orifice which must be cut away.

Coarser broaches such as the Kerr or Asko are now used in two or three sizes; sulphuric acid solution 30% or 50% or Phenol-Sulphonic (Buckley) is used to soften the dentine when necessary. The canals are well dried and the acid pumped down with an Antalum broach, which will not corrode. It remains from one to three minutes and is then neutralized with a sat. solution of sodium bicarbonate. A marked effervescence takes place, which will boil out fragments of debris or sometimes broach barbs or tips.

After the canals are well reamed, debris is raked out with a fine barbed broach and the canals sterilized as above with the acid solution. They are now ready to fill.

The canal must be dry—otherwise gutta percha will not adhere, and a medicated paste cannot be pumped down to the end—for these pastes are all oils, the saliva is water, and oil and water will not mix. When you have used J. & J. paper points, and compressed air and the heated canal drying point and are sure the canal is dry, go back and try another paper point—you will usually find the apex still wet. I believe this to be one of the commonest causes of failure to fill the apex.

As to root filling materials. Everything under heaven which is small enough to ram into a root canal has been tried. The writer has crossed the trail of one man who filled canals with blunt points of solid tin. Another informed us that he sometimes used a hog's bristle dipped in cement. And there is the villain who fills them with cement pure and simple.

A good deal has been written of late regarding medicated cotton as a canal filling. Two or three cases have been dug up in which the tooth remained quiescent for some years and letters and editorials have appeared claiming that if cotton could last so long "there must be something in it." Of course there was something in it—there was colossal luck in it—the luck which accompanies

the one exception among five millions. And there was a teaming colony of pathogenic bacteria in it, too, poisoning the patient and shortening his life. I have removed these cotton fillings and dropped them in sterile broth and incubated them and gotten virdans or hemolyticus almost every time. Dr. Ottolengui has cultured them—and I have two of his slides with me which will speak for themselves. What else can we expect when we consider the findings of Price with reference to cultures from cotton dressings which have only been in a few days or weeks? If there is one man here who uses cotton fillings, I implore him, don't take my word for it or anyone's else—and don't be coward enough to dodge the issue! Go home and call in one of your own patients—remove a cotton filling, drop it in a tube of broth, or wipe it across an agar tube which your hospital or your nearest bacteriologist will furnish, and get a report on it. You will agree with me then—it is positively criminal to use it. Cotton is organic and will itself decompose.

One writer states that cotton is all right if it reaches the apex. Ye gods and little broaches, even if this were true, could you find a material more difficult to get to the apex? Then why use it?

As to gutta percha—you are all familiar with the methods of using it. Place a drop or two of Callahan's rosin and chloroform solution in the canal and pump it to the apex. Follow that with a drop or two of chlora percha, also pumped up. Then there are two methods—either use a gutta percha point too large for the canal and pump and pump and pump until the point works up into the canal, or use several small points and pluggers adding and packing point after point. If the pluggers stick, cover their points with parraffin. Ivory has a very good set of pluggers.

Rosin solution alone does not show up well in radiographs—used with the chlorapercha in this way it shows up well. The writer prefers to use bismuth-formocresol paste, then chlora-percha, and then the points.

As to medicated pastes—I prefer them in most cases, *provided* that the formula is a good one, and that the paste is correctly introduced. A minute portion should be introduced on a fine smooth broach and led down the side of the canal and pumped *at the apex*, until the patient feels it. More could be added (taking care not to trap air under it) until the canal is full. Gutta percha is then packed over it and compressed over each canal until the patient feels it. We must remember, however, that half the time when the patient feels it the filling has not reached the apex—air has been trapped and compressed sufficiently to be felt.

Neutral agents, such as glycerine or oxide of zinc are useless and to be avoided. For six or seven years the writer has used a paste made up of three parts bismuth subnitrate (a fine white powder), one part iodoform, and formocresol (Buckley) to make a thick creamy paste. This paste is readily introduced, is a positive germicide and remains so indefinitely. It shows up well in radiographs, is easily removed, and when it reaches the apex usually causes the tooth to "grumble" slightly for a few minutes, a fairly dependable indication that it has "reached." There is no appreciable pericementitis afterward, and any objection to the irritating properties of the formocresol is answered by radiographs taken a year or two later, showing the material where it has been pushed thru the apex, surrounded by healthy bone. A certain amount of irritation is stimulating.

My advice to any man who uses a medicated paste is—add 50% bismuth subnitrate—it will then show in the radiograph and you will not be accused of leaving root canals empty.

PROVING THE BASAL CAUSE OF THE DISEASE PYORRHEA ALVEOLARIS.

By S. N. Young, D. D. S., Cincinnati, Ohio.

AS A BASIS for investigation it was accepted as a pathological fact that pyorrhea alveolaris is a suppurative inflammation, and that an inflammation merely represents the succession of changes that takes place in vital tissue as the result of an injury, or accompanying an intermittent or a consistant irritant; the cardinal symptoms manifesting according to the character of the tissue involved. The disease began with the stage of hyperaemia and followed the usual course of an inflammation to its natural termination, to the elimination of the irritant, provided it was not interferred with favorably or otherwise before the natural course of events was completed.

In determining the basal cause of the inflammation in question it was necessary to discover an irritant constant in its association with the disease. Two factors only were found to be invariably present in the disease pyorrhea alveolaris; namely, the tooth afflicted, and for correct nomenclature, the presence of active suppuration; the tooth representing the irritant, suppuration the tissue reaction.

Four clinical facts proved the tooth itself to be the direct irritant. First: In the pyorrhea tooth constructive change in the pulp tissue was always found. This fact demonstrated natural defense of pulp vitality against external irritation. Second: Pericemental destruction always preceded along the line of attachment to the tooth cementum. This proved lack of harmony between the tooth itself and its pericemental associate; or that the pericemental membrane, the seat of the inflammation, was being irritated by the ever present tooth. Third: The accompanying suppurative process (constant) whose function it is to eliminate substance inimical to life; examples of which function can be seen in the removal of the intractable splinter, in the exfoliation of the sequestrum of necrosis, and of formation of avenue for egress of gases and like irritating products thru the process of abscess formation. Fourth: Providing the third assertion, when upon removal of the afflicted pyorrhea tooth the disease was invariably cured, in so far as the particular tooth was concerned.

The question then necessary was, What is causing the tooth to become an irritant? Only one factor was found to be constant in its association with the afflicted tooth to convert it into an irritant, that factor was the application to the tooth of a coagulative temperature, the usual agent of application being food ingested at a temperature, by thermometer test, invariably above the scalding point, i.e., above 150°F. In severe afflictions usually at least one item of food, sometimes all of the food, was being ingested at a temperature above 160°F. The heat of the cigar and of the cigarette also was frequently found to be an inducing factor when from localized habit a local manifestation

would present, general conditions and habits favoring.

The only requirement found necessary to eliminate the disease in the incipient stage was the avoidance of food or of contact with substance of a temperature sufficiently high to bring about coagulation of the tissue albumin; that is, the food was allowed to cool to a temperature below 120°F. before ingesting; other habits being corrected when found associated.

Altho it is generally agreed to by dietitians that food should not be ingested at a temperature much above that of the body itself, (98.6°F.) and there is sound logic in that decision, in severe cases of pyorrhea alveolaris, when from excessive absorption extensive tooth substance was exposed, we were enabled to bring about curative effects by placing an upward temperature limit at 110°F., the upward degree obtained by an instinct test in which test the food was allowed contact with the external surface of the lips of a proper subject, this surface being supplied with sensitive nerves which convey the protecting impulse, a fact which does not apply to the oral mucous membrane, the anatomical peculiarity of which is its "characteristic lack of sensation."

The same causative factor that is pointed out as being the basal cause of the aforementioned disease, the application to vital organized tissue of a coagulative temperature, has also been associated with the following diseases: diabetes-mellitus, from destruction of the ptyalin and early stomach digestive ferments (proteid bodies); rheumatism, endocarditis and chronic nephritis, from circulation thru the vascular system of coagulated substance; and a possible association of the disease or reaction known as gout, from chemical reduction of certain tissue elements, the symptoms developing along the line of inherent structural weakness, and manifesting in people of listless habits, or in those whose occupation does not bring about the natural counter effect.

PYORRHEA CUM ULCERATIONE GINGIVAE ABSORPTIONEM PROCESSUS ALVEOLARIS, OR PYORRHEA CUM ULCERATIONE GINGIVAE ABSORPTIONEM ALVEOLI.

By Jennie Clark Morrison, D. D. S., Milwaukee, Wis.

THE term "Pyorrhea alveolaris," so often used to denote an ulcerative condition of the pericemental fibers, with a consequent pus-flow, is inexact, incomplete, and grammatically incorrect. It is inexact because the word "Pyorrhea," meaning "pus-flow" may be a purulent discharge from any organ or part of the body; it is inexact because the term alveolaris (generative case, meaning "of the alveolus") may pertain to any alveolus in the body, namely, to the alveoli or air-sac of the lungs, or to any one of the many honeycomb cells of the gastric mucous membrane, as well as to the alveoli contained in the alveolar process of the submaxillary bone.

Let us examine this title or rather this misnomer for a moment. "Pyorrhea" (a pus flow), a noun, singular number, nominative case, first declension, is so far, correct, but too indefinite, as the word must be limited in same way to define the exact location of the purulent condition. How then shall this term "Pyorrhea" be limited to mean, or to restrict its meaning to the pus-flow found exuding from the pericemental fibers and other soft tissues, (comprehensively know as the "gingivae,") that surround and support those organs of mastication, the teeth, without which organs a truly normal condition of the body and mind, seldom exists.

If it is maintained by a few practitioners (tho the belief seems unwarranted to most of us,) that this pus-flow is caused primarily by the actual disintegration of the alveolar process of the inferior maxillary bone, or, in other word, if this "processus," by incomplete metabolic action, actually breaks down into pus globules, and flows out into the oral cavity, then the term "Pyorrhea processus Alveolaris" might be allowable; "processus" being a noun, fourth declension, genetive case, meaning "of the process" (declined nominative "processus," genetive "processus," etc.); and the word "alveolaris," an adjective 3rd declension, genetive case (declined, according to Harkness Latin Grammar Edition 1898, Page 48, Paragraph 128, adjective ending in "r," as nominative "alveolar," genetive "alveolaris") and agreeing with the noun "processus" which it limits in number and case. Those who hold this, to us, untenable position, that pus-flow is caused entirely by the breaking down of the alveolar process, or that the pus-flow is caused by this absorption must use to complete their title, the "ablative of cause" with the preposition "cum," and they must say "Pyorrhea gum absorptione processus alveolaris."

The above title at least tells us something definitely—altho we believe that it is quite misleading as only a few practitioners now believe that the destruction of the alveolus is the primary cause of the pus-flow. Practitioners, generally, today, will not accept this belief, or this title, as we claim that the inflammation, subsequent ulceration and breaking

down of tissues and consequent pus-flow, comes rather, from the inflammation, ulceration and ultimate destruction of the pericemental fibres supporting the tooth in the alveolar socket. We believe that this wasting, this absorption of the process, is a secondary matter, never met with except in cases of malocclusion or malnutrition, until the pericemental fibers and other soft parts (all included under the comprehensive term "gingivae") are destroyed; and that upon the absorption of this process, the calcareous particles resulting from the incomplete destructive metabolism, or katabolism, of the process are rather, (following the simple law of gravity,) deposited upon the roots of the adjacent teeth.

Now if it is agreed that the ulceration of the pericemental fibers is the exciting cause; or using the more general term "gingivae" to designate the pericemental fibers and the soft parts adjacent thereto; if it is agreed that the ulceration of the gingivae is the exciting cause of the pus flow, then we may properly say "Pyorrhea gingivae." This will mean to us a pus-flow of all the soft parts surrounding the teeth.

A careful observation of the local degeneration, of the lesions present, discloses the fact that an absorption of the alveolar process follows. This absorption would naturally follow the cessation of physiological function, and is due to the fact that there are no longer any pericemental fibers to support. To express this, the ordinary accusative "absorptionem," must be used (not the ablative of cause) and those of us who take an intelligent stand, will use the title that exactly defines the conditions found to be present. The title, the "nomer" will be "Pyorrhea Cum Ulceratione Gingivae Absorptionem Processus Alveolaris," the literal translation being —"A pus-flow caused by the ulceration of the gingiva with absorption of the alveolar process." "Processus," noun fourth declension, singular number, genetive case; and "alveolaris," adjective, third declension, singular number and genetive case, to agree with noun processus Or, "Pyorrhea Cum Ulceratione Gingivae Absorptionem Alveoli," the literal translation of this being—"A pus-flow caused by the Ulceration of gingivae with absorption of the alveoli." Until such time as our Research Department may pass upon this subject of nomenclature, let us refrain from using the indefinite, incomplete and ungrammatical misnomer "Pyorrhea-alveolaris." If we wish a contraction of this "nomer," let us use the term "Pyorrhea alveolar" ("alveolar pyorrhea"), or "Pyorrhea alveoli," (Pyorrhea of the alveoli), either one of which is grammatical; or the more exact contraction that definitely locates the pathogenic condition, "Pyorrhea Gingivae."

Preparedness League

FREE DENTAL ACTIVITY FOR THE NEW NATIONAL ARMY.

Outline of Procedure Followed in New York.

The Dental Committee of the General Medical Board, which is the agency for the Medical and Dental Preparedness in this War Emergency has made it possible for every dentist in the United States to assist in this work, under the direction of the Surgeon General's Office, Headquarters War Department, Washington, D. C., and under the direct supervision of First Lieut. William A. Heckard, D. R. C., U. S. A., on active duty and stationed at New York City.

Up to date it has been impossible to give supervision from the Surgeon General's Office to more than the Eastern Department. The supervision of the Northeastern Department has just started and the Central Department is getting under way. It is desirable, however, that every dentist in every state of the Union get busy and do his bit and for that reason an outline of the procedure followed in New York will be given herewith.

Form No. 1 is a return postal card addressed to every dentist, the message side of which reads:

NATIONAL IMPORTANCE.

The Dental Profession, represented by the National Dental Association and the Preparedness League of American Dentists, has asked the United States Government for permission to fix the teeth of all the conscripts for the new National Army.

This permission has just been granted and the work will begin Monday, August 27. We want every ethical dentist to give at least one hour each day in his own office for this service The dentists of Greater New York must take care of 11,500 men by September 5. Will you do your bit? Answer **at once** on return postal.

PREPAREDNESS LEAGUE OF AMERICAN DENTISTS,
Care Academy of Medicine,
17 West 43rd Street, New York City.
Telephone: Murray Hill, 6911.

This matter was changed as first five per cent. left after September 5th.

The address side of the return half of Form No. 1 reads:

Preparedness League of American Dentists,
Academy of Medicine,
17 West 43rd Street, New York City.

The message side of the return half of Form No. 1 reads:

I hereby volunteer my services to repair the teeth of the new recruits in my office as follows:

Fillings Extractions Making Plates

(Mark cross after kind of service offered)

		(hour)		(hour)
Mondays	from	.....	to	.....
Tuesdays	"	.....	to	.....
Wednesdays	"	.....	to	.....

Thursdays " ..... to .....
Fridays " ..... to .....
Saturdays " ..... to .....
Sundays " ..... to .....

Appointments to commence on notice from the League.

Name.....
Address.....
'Phone.....

The League will endeavor to utilize fully, the hours reserved by you.

ment envelope, by Lieut. W. A. Heckard. Greater New York, which includes Brooklyn and the Bronx, is now furnishing 500 hours per day.

WAR DEPARTMENT
OFFICE OF THE SURGEON GENERAL
WASHINGTON
September 18th, 1917.

My Dear Doctor:

The Dental Committee of the General Medical

DAILY SCENE IN THE INFIRMARY OF THE COLLEGE OF DENTAL AND ORAL SURGERY, NEW YORK.
We have forty-two Colleges giving free Dental services to the selected draft men in their vicinities.

The dentist fills in the hour he will give each day, and checks off the work he wishes to do, i. e., fillings, extractions, or plates. He writes his name, address and telephone number, plainly and mails it to Central Office. In the large cities these cards are indexed by days and hours in a file drawer, or box, by the clerk—usually a young woman experienced in such work.

At the time these return postal cards are sent out, the following letter, Form No. 6, should be sent out in a Govern-

Board, which is the agency for the Medical and Dental Preparedness in this War emergency had made it possible for every Dentist in the United States to assist in this work, under the direction of the Surgeon General's Office, Headquarters War Department, Washington, D. C., and under the direct supervision of First Lieutenant William A. Heckard, D. R. C., U. S. A., on Active Duty and stationed at New York City.

The Dentists of the Eastern Division, which comprises New York, New Jersey, Pennsylvania, Delaware, Maryland and Virginia, proceeded with the care of the mouths of the troops now mobilizing and the showing made has been sufficiently good to warrant extending

this work thru all the States of the Union; therefore, it behooves all to get busy at once, and we need your help, need every man to give all the time he possibly can.

In the new 42nd Division just ordered to France, composed of Regiments from twenty-six states, the 69th Regiment, N. Y N. G., owing to the work of the Preparedness League of American Dentists in New York City, is the only one dentally fit; a result of which New York may be proud.

If the Allies are going to win, each one must do his or her part Every bit of service rendered helps to shorten the War.

Women and children are knitting sweaters, socks, helmets, et cetera, and making bandages, surgical dressings and fracture pillows. You and I cannot do these things, but we can fill and extract teeth and **no one else can**—that is part of our job.

Tabulated records will be forwarded to the War Department, giving the name of every dentist who has volunteered service under the conditions here outlined, with a memo of the work done by each man. Do you want your name to be missing from this Honor Roll? Wake up brother! Let's get shoulder to shoulder like the boys in the trenches. They are giving all their time (and their lives and their limbs) and undergoing cheerfully, untold hardships, while we stay at home in comfort. Will you give part of your time, or aren't you a real American? This is YOUR War. Some men are giving all their time for this dental service, others are giving half their time. We ask you for at least one hour each day.

The Dental Committee of the General Medical Board, Cooperating with the Dental Profession.

LIEUT. W. A. HECKARD, D. R. C.,
Detailed by the Surgeon General's Office.

On receipt of the replies from Form No. 1 card, each dentist was mailed a postal card, Form No. 2. If a dentist wishes to use other hours than those registered at Central Office, when he found a case he could not finish in an hour, he has a right to do so, but experience has shown that the exceptions do not justify breaking in on the hour set aside for the next "soldier man."

Form 2

INSTRUCTIONS TO DENTISTS.

All devitalized teeth, all teeth **having a history of periodical abscess** (even if without symptoms at the time of examination) all teeth acutely afflicted with **pyorrhea** as well as all crowded and inflamed **third molars** should be extracted.

The only teeth which should be filled at this time are those which thru having painful cavities are made useless for masticating purposes, and those which having deep cavities must be filled immediately to prevent involvement of the pulp

Whenever practicable, amalgam fillings should be inserted in occlusial cavities; cement should be used as the filling material in all other cavities.

Make no return appointments. See each man but one sitting.

Be sure to fill out, sign and mail the postal with your work recorded thereon to

PREPAREDNESS LEAGUE OF AMERICAN DENTISTS,
17 West 43rd Street, New York.

Printed slips of paper for Form No. 3-A were tried but it was found some dentists were too busy to direct and stamp an envelope, so the card plan was invented. As these are to be used in compiling a Government Report, they go out franked, so that all the dentist has to do is to sign and mail it.

Message side of Form No. 3-A:

Form 3A

City of.....District No.....State of.....
Name..... Address.....
Present this card to Dr.....
Address.....
On.....
Morning Fillings and Extractions.
Afternoon Fillings only.
Date....at....o'clock Extractions only.

Carefully record all work done on chart, sign and mail this record for Government report.

1ST LIEUT. W. A HECKARD.
D. R. C., U. S. A.

Under direction of the Surgeon General's Office, War Department, Washington, D. C.

Name
.....
Address D. D. S.
.....

Indicate teeth filled by f. Indicate teeth extracted by x.

Address side of Form No. 3-A:

Form 3A

WAR DEPARTMENT
Official Business
of Surgeon General's
Office

Penalty for Private Use, $300.

John Doe,
Blank Street,
City, State.
Manhattan.

The Dentists are now ready for the men of the selected draft. The names are procured from the District, or Local Exemption Boards, as the case may be and a card, Form No. 5-D, is mailed in 500, or 2,000 lots.

The message side of Form No. 5-D, to which the date and hour is stamped and mailed two days before the time set to assemble at Armory for examination, reads:

Form 5-D

(Bring this card with you)

Report at
(Print or rubberstamp—Place, Date and Hour.

to have your mouth and teeth examined.

By direction of the Dental Committee of the General Medical Board.

Dental Services Required

Yes ☐

No ☐

First Lieut. W. A. Heckard,
D R. C.
Detailed by the Surgeon General's Office.

For use in smaller cities, the same franked cards are given to the State Director of Dental Activities, and the place, date and hour is written or stamped in by the chairman of each local unit.

In New York City, Brooklyn and Bronx, from 500 to 2500 cards, Form No. 5-D, were sent out, two nights each week. A circular letter containing the following was given to the members of the examining squad:

THE METHOD OF CONDUCTING EXAMINATION OF THE MOUTHS OF CONSCRIPTS.

1. A table and chair should be provided in advance for each member of the examining squad for convenience in handling the necessary clerical work at the armory, or other place appointed for examination of conscripts

2. The examining squad must have two sets of rubber stamps, one of which reads: "Accepted by Board—Not Claiming Exemption," and the other of which reads: "Accepted by Board—Exemption Claimed." Each conscript, on entering the examination room, must be questioned whether he has claimed exemption or not and his card must then be stamped accordingly. The conscript retains his card (Form No. 5-A) until after the dental examination is finished These cards (Form No. 5-D), properly marked, are then collected and sent to your central station. This will make it possible for you to have a record of every man who was told to report for dental service and who failed to so report

Form 7

Name .....
District .....
Borough .....

TAKE THIS CARD
to the Office of
THE PREPAREDNESS LEAGUE OF AMERICAN DENTISTS
at the
NEW YORK ACADEMY OF MEDICINE
17 West 43rd Street
Tomorrow Morning Between 9 and 1 o'clock

EXTRACTIONS ☐

FILLINGS - - ☐

BOTH - - - ☐

3. Slips for dental service (Form No. 7) should be given only to men not claiming exemption. Give no dental service to men claiming exemption until such claim has been waived, or disallowed.

4. If there is a lieutenant of the D. R C. in uniform in your vicinity he should organize an examination squad of five or ten men, who should examine conscripts each evening sufficient in number to fill all the hours of all the volunteer dentists for the following day.

5. It is advised that all examiners, as far as possible, be in Government uniform; if these are not available, civilian dentists must do the work.

6 It is also advised that the same squad do all the examining at a given point where conscripts are being assembled for this purpose, as experience has shown that after a squad has once become conversant with the work they proceed rapidly, and any change in the personnel of the squad interferes with their efficiency.

7. The conscripts selected for the evening's examination, having been notified the previous day as per notice card (Form No. 5-D) to report at an armory or other suitable place at 7:30 P M., should be met there by the examining squad. A large supply of pine stick tongue depressors should be at hand, and each member of the examining squad shall supply himself with a small flashlight, preferably the style that looks like a large fountain pen, and is easily carried in the waistcoat pocket.

8. The conscripts shall be divided into as many squads as there are examining dentists present; and shall stand in rows for examination.

9. A conscript is selected from each squad

to act as clerk. He is given a sufficient number of slips (Form No. 7) and a pencil and accompanies the examining dentist as he passes down each row. He writes down the name and makes a cross in the proper space, as directed by the examining dentist, extractions, fillings, or both; at the same time he should mark the card (Form No. 5-D) whether dental service is required, yes or no as the case may be

10. The examining dentist should use a separate wooden tongue depressor for each conscript. With a tongue depressor in one hand and an electric light in the other, make a quick survey of the upper teeth and gums, then the lower, and give instructions to his clerk, "Filling," "Extraction," or "Both," or no service, as the case may be.

11. The conscripts before leaving the hall are handed their examination slip (Form No. 7), which instructs them to go to the central office at a certain hour the next day, where they are assigned to the individual volunteer dentists and given a postal card (Form No 3-A) addressed to the central office and on the reverse side of which is a chart and other details.

12. At your central office rubber stamps are recommended, for the convenience of the clerk, who will stamp in the name of the "Ward," "District" or "Borough" as the case may be, also the days of the week (Form No. 3-A.)

13. The man takes this postal card (Form No. 3-A) with a chart upon it to the dentist, at the time and address indicated thereon. The dentist will do the filling or extracting, as per check mark on the card, and dismiss the man with **no return appointment**, it being remembered that it is far better, from the viewpoint of military efficiency, to improve the dental condition of a whole regiment SOMEWHAT, rather than make entirely perfect the teeth of a few men—accordingly, too much time should not be given to individuals. Men needing second appointments are referred back to the central office the next day and given another assignment. The record of each case should be marked on Form 3-A and mailed at once.

It may seem on first reading that there is too much detail in this arrangement, but this is due to the fact that the Surgeon General's Office requires this data for their statistical records.

Under the present arrangement only one dentist per thousand is permitted in the Army.

One dentist to a thousand men is not sufficient to care for the dental needs of a new army before it is ordered to foreign service.

It is our belief that records of this sort will have a powerful influence in helping to convince our lawmakers that the present provision for Dental Corps in the U. S. Army and Navy is entirely inadequate, and that in order to maintain a high standard of dental and oral health (on which general health so much depends) in our Army, the Dental Corps must be increased and strengthened and administered by high officials who are dentists, and understand dental matters.

You will, therefore, see the necessity of keeping careful records of all dental work done during this campaign, as you will be called upon for it.

In order to raise funds to pay for printing, postage, clerical assistance, etc., you should appoint a Finance Committee at once, whose duty shall be to make an appeal for money.

It is not necessary that all of these forms be used in the smaller towns, as the conscripts can be reached much easier than in a large city.

It is suggested that in the smaller towns the dentists be sent as many cards, Form 5-D, as there are conscripted men in that town and the dentists of that town will secure the names from the draft boards and, after examining all of them, will divide amongst themselves, those certified drafted men needing dental work. Fill out the report on postal card, Form No. 3-A, for work done on each man and mail same to state headquarters. These reports will then be forwarded by the Director of each state to the Director of Dental Activities of his Department, and in turn, by him, to Lieut. W. A. Heckard, for the Surgeon General's Office.

The work of making dentally fit the men of our National Army is a patriotic service. It is the duty of every dentist to help and every patriotic dentist in the country should feel it a privilege to do his part.

While this work is being done in New York and other places by the Preparedness League of American Dentists, it must be distinctly understood that it is not necessary to belong to that, or any other organization in order to be allowed to do your part for it is distinctly stated that "The Dental Committee of the General Medical Board, has made it possible for EVERY dentist in the Unit-

ed States to assist in this work." So that, while you may not be a member of the Preparedness League of American Dentists, you can still do your bit, but there must be cooperation and if there is no regularly organized body doing this work in your community, you should take your instructions from and report to the Preparedness League of American Dentists of your state, or the Director of Dental Activities of your state.

STARTING FOR THEIR CAMP AFTER TREATMENT IN THE INFIRMARY OF THE COLLEGE OF DENTAL AND ORAL SURGERY OF NEW YORK.

Send your name at once to the Direc-

tor of Dental Activities of your state or the Director of your Department as one who is willing to help the big cause by giving free dental service to the men who are going to the front.

In order to facilitate this work on the part of the dentists, Provost Marshal General E. H. Crowder wrote a letter to the Governor of each State in the Eastern Department, requesting that every encouragement and cooperation shall be given to assist the dentists in this work. The Governor then wrote to the Chairman, Secretary, and Chief Clerk of the District of New York City, as follows:

1. Your attention is invited to communication from General E H. Crowder, Provost Marshal General, to his Excellency, Governor Charles S. Whitman, on the date of August 23rd, 1917, from which the following paragraph is quoted "Under the law only one dentist per thousand is permitted in the army. One dentist to a thousand is not sufficient to care for the dental needs of the new army before it is ordered to foreign service. The patriotic offer of these members of the dental profession is, therefore, of great value, not only to the comfort but to the efficiency of the National Army." It is desired by the Governor that every assistance possible be rendered to the Surgeon General's Office in this matter.

2. * * *

Your full cooperation will be greatly appreciated.

* * *

This plan has been started as an experiment in the Eastern Department, and it is working well. It should be taken up by each of the other Departments in the United States and pushed at once, so that no precious time will be lost.

DIRECTORS OF FREE DENTAL ACTIVITIES FOR THE NEW NATIONAL ARMY.

Chas. F. Ash, Director of Departments.

EASTERN DEPARTMENT.

E. G. Link, Director of State of New York, 226 Cutler Bldg., Rochester, New York.

J. B. Stevens, Director of the State of New Jersey, 61 Cherry Street, Elizabeth, New Jersey.

R. Hamill Swing, Director of State of Pennsylvania, 1623 Walnut Street, Philadelphia, Pa.

Wm. G. Foster, Director of State of Maryland, 851 N. Howard Street, Baltimore, Maryland.

J. A. C. Hoggan, Director of State of Virginia, Professional Bldg., Richmond, Virginia.

Wm. C. Speakman, Director of State of Delaware, 1201 Delaware Avenue, Wilmington, Delaware.

M. F. Finley, Director for District of Columbia.

NORTHEASTERN DEPARTMENT.

W. D. Tracy, New York City, Director

H. A. Kelley, Director of State of Maine, Portland, Maine.

P. H. Roberts, Director of State of New Hampshire, Rochester, New Hampshire.

P. M. Williams, Director of State of Vermont, Rutland, Vermont.

Geo. H. Payne, Director of State of Massachusetts, 29 Commonwealth Avenue, Boston, Mass.

Walter R. McIntyre, Director of State of Rhode Island, 521 Broad Street, Providence, Rhode Island.

A. W. Crosby, Director of State of Connecticut, 29 College Street, New Haven, Conn.

CENTRAL DEPARTMENT.

C. N. Johnson, Director Central Department, 913 Marshall Field Co.'s Bldg., Chicago, Ill.

SOUTHEASTERN DEPARTMENT.

Thomas P. Hinman, 4th Nat'l Bank Bldg., Atlanta, Ga., Director.

WESTERN DEPARTMENT.

J. D. Millikin, 323 Geary, San Francisco, Calif., Director of the Western Department.

SOUTHWESTERN DEPARTMENT.

W. D. McCarty, 3118 Moor Bldg., San Antonio, Texas, Director of the Southwestern Department.

DIRECTORS OF EASTERN DIVISION OF CENTAL DEPARTMENT.

Frank Casto, Rose Bldg., Cleveland, O.

E. L. Pettibone, 6503 Detroit Ave., Cleveland, Ohio.

H. C. Kenyon, Rose Bldg., Cleveland, O.

J. P. Henahan, Rose Bldg., Cleveland Ohio.

Guy D. Lovett, Rose Bldg., Cleveland, Ohio.

W. H. O. McGeehee, Director of State of Ohio, Adelbert and Cunningham Roads, Cleveland, Ohio.

Carl D. Lucas, Director of State of Indiana, Indianapolis, Ind.

O. W. Burdats, Director of State of West Virginia, Wheeling, West Virginia.

C. J. Lyons, Director of State of Michigan, Ann Arbor, Michigan.

H. B. Tileston, Director of State of Kentucky, 916 Stark Bldg., Louisville, Ohio.

DIRECTORS WESTERN DIVISION OF CENTRAL DEPARTMENT.

D. M. Gallie, 32 N. State St., Chicago.

J. P. Buckley, 39 S. State St., Chicago.

J. E. Hinkins, 1467 E. 53rd St., Chicago.

Geo. N. West, 32 N. State St., Chicago.

F. W. Gethro, 122 S. Michigan Ave., Chicago.

G. Walter Dittmar, 59 E. Madison St., Chicago.

P. B. D. Idler, 30 N. Michigan Ave., Chicago,

Austin F. James, 25 E. Washington St., Chicago.

L. W. Strong, 30 N. Michigan Ave., Chicago.

T. L. Grisamore, 29 E. Madison St., Chicago.

J. A. Cotton, Joplin, Mo., Missouri.

H. E. Latcham, Jefferson, Iowa, Iowa.

L. A. Meyer, Oconomowoc, Wis., Wisconsin.

V. D. Vehe, 1010 Donaldson Bldg., Minneapolis, Minn., Minnesota.

L. L. Eckman, Grand Forks, N. Dak., North Dakota.

Ernest W. Elmn, Sioux Falls, S. Dak., South Dakota.

S. A. Allen, Loup City, Nebr., Nebraska.

Geo. A. Crise, Manhattan, Kansas, Kansas.

NEW YORK DENTISTS PRESENT AMBULANCE TO UNITED STATES GOVERNMENT.

September 5, 1917.

Oral Hygiene Committee of the Dental Society of the State of New York.

Sirs:—The Surgeon General directs me to acknowledge the receipt of your letter of August 29 in which you state that the dentists of the State of New York desire to present to the Government of the United States, a dental ambulance on a Ford Chassis, complete, with portable outfit for use in the present war, and to express to you his sincere and deep appreciation of your interest in the welfare of our troops abroad and of your generous gift.

Since this apparatus is destined for service overseas, it is requested that you have it consigned to the Officer in Charge, Medical Supply Depot, American Expeditionary Force, and delivered to the Medical Supply Officer, Port of Embarkation, Pier 45, North River (Free Lighterage) New York City.

Your letter has been referred to the Surgeon of the American Expeditionary Forces for his information and that he may make the best possible use of the ambulance and outfit furnished.

Again thanking you for your generous gift, I am

Very respectfully,

(Signed) EDWIN P. WOLFE,
Colonel, Medical Corps.

WESTERN DENTAL COLLEGE EQUIPS DENTAL MOTOR AMBULANCE.

Under the direction of Doctors L. Hammil, Olathe, Kans.; J. A. Thompson, Geórge Aiken, B. L. Worthley, M. W. Rice, Chas. Gillman, Perry F. Gilbreath, George Herrin, Emmit J. Craig, of Kansas City, and Frank Webster, Carthage, Mo.; E. C. Glass, Independence, Kans.; T. W. Arnold, Butler, Mo.; G. C. Wallace, Shawnee, Okla., and the Board of Directors (Tanzey, Rinehart, Hillias, Johnston, Lieut. Braniger) the Western Dental College will organize and equip one or more DENTAL MOTOR AMBULANCE UNITS, and present them to the Preparedness League of American Dentists, Kansas City Branch, to be turned over to the United States Government.

This is the first college to take such a step and this Committee is in hopes that every Alumnus will avail himself of the very great privilege of making a generous donation to this fund.

No greater opportunity presents itself than this one for our profession, and especially for our Alma Mater, to assist in relieving our brave and courageous brothers who are directly engaged in this terrible conflict.

The profession that is favored as ours is, by being permitted to wait upon those who fight in the trenches, should respond graciously and liberally. We are told that DENTAL AMBULANCE UNITS are doing great work for the soldiers and many are needed.

One unit consists of FOUR DENTISTS, TWO ASSISTANTS, A MOTOR AMBULANCE and DENTAL EQUIPMENT for the four operators.

The men chosen will be Western Dental College graduates.

Ten thousand dollars is desired for the work outlined by this committee. Funds left from the amount required for Ambulance Equipment will be used for such work as assisting our graduates, if need be, who go to the front as Army Dental Surgeons, and the families of such members that might be in distress.

Send $10.00 to $1000.00, or any amount you can, and it will be gratefully received. Those contributing will be published in some periodical and an honor list made that will go down in history of the Western Dental College and on record with our Nation, and in fact the whole world.

Increase your personal donation by reading this letter to your friends and patients and tack the enclosed card on your bracket table in front of your patients. They are interested and want to help. We will notify you when the fund is closed and you will receive detailed statements of the money expended.

Go to your newspapers and ask for a write-up, and if any liberal donations from grateful patients, or patriotic friends, come to you, ask for the privilege of making it known. If desired, we will place the names of your friends who give under your name on the Honor Roll.

The College and Committee have made a liberal start on this subscription. It is desired to have this money raised in ten days or two weeks so please send it in as soon as possible.

It was the sense of this Committee that our Boys would respond enthusiastically to this much needed service.

Folding operating chairs are wanted, —have you one to donate? Photographs of our Unit, when equipped, will be sent to all subscribers.

Respectfully submitted by the Secretary.

R. J. RINEHART.

Dental Mobilization and the War

REPORT OF THE COMMITTEE ON DENTISTRY, GENERAL MEDICAL BOARD COUNCIL OF NATIONAL DEFENSE.

Washington, D. C., Sept. 9, 1917.

The Committee on Dentistry submits the following report of progress:

1. Free dental treatment of men accepted for the National Guard and National Army previous to federal mobilization.

2. Enrollments in the Dental Reserve Corps, U. S. Army.

3. Assignments of dental officers to duty.

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1. Free dental treatment of men accepted for the National Guard and National Army previous to federal mobilization.

With the approval of the Surgeon General's office permission was sought from Provost Marshal General Crowder to order accepted Selective Service (drafted) men to appear for dental examination before such civilian members of the dental profession as might volunteer for this service, this to be carried on under the supervision of the dental department of the Surgeon General's Office with the understanding that all service rendered by the members of the dental profession would be gratuitous.

The purpose of said examinations and dental operations was to make it possible to have the members of the National Guard and National Army reach their camps with mouths and teeth in order in so far as it might be possible to make them so in the brief time available.

This work was considered imperative for the reason that the law permits only one dentist to a thousand men in the line of the army and one dentist to a thousand is not deemed sufficient by those who should know to care for the dental needs of the new army before it is ordered to foreign service.

The Provost Marshal General heartily approved of the proposed plan and gave every assistance possible, urging by personal letter each Governor in the Eastern Department to call upon the local exemption boards to render every assistance to the end that the dental treatment might be successfully carried forward, and expressed it as his opinion that the patriotic offer of the members of the dental profession would be of great value not only to the comfort but to the efficiency of the National Army.

Following the Department's approval of this committee's recommendation, First Lieutenant W. A. Heckard, D. R. C., of New York City was ordered to active duty and placed in charge of this work.

As a concrete example of what the Dental Committee is now accomplishing

in the Eastern Department in cooperation with the dental profession and with one of our sub-committees, the Preparedness League of American Dentists, in making dentally fit many of the members of our new army, I take pleasure in submitting the following statement: In the City of Greater New York alone from June 16, 1917, to September 6, 1917, a period of approximately twelve weeks, more than 21,000 men were examined and more than 24,000 dental operations performed.

In the accomplishment of this work more than 1067 appointments were made. In addition examinations are now being conducted two or three nights of every week and approximately 1000 men are being examined on each of these nights.

The above statements have reference to New York City in which city alone we find between four hundred and five hundred members of the dental profession donating daily a minimum of one hour of their regular operating time together with all necessary materials to this work, while a number are giving ALL of their time to this work gratuitously.

The items of expense to the Government comprise the pay of one first lieutenant, Dental Reserve Corps, and stationery and franking privilege utilized in notifying the men who are to form our new army that they are to appear in the armories for dental examination and to report at the respective dentists' offices for the gratuitous services above outlined.

2. **Enrollment in the Dental Reserve Corps, U. S. Army.**

There have been recommended by the Department to the Adjutant General's office for commission as first lieutenant, Dental Reserve Corps, 3776 members of the dental profession. Of this number 2472 have accepted commissions.

Orders were issued Saturday, September 8th, by the Adjutant General's office, upon recommendation of the Surgeon General's office, for sufficient number of Dental Reserve officers to report for duty at the various camps and cantonments to the end that we will have in each camp in a very few days the full quota of dental surgeons for the strength of the command fixed by the War Department for these camps. A previous order issued provides for a sufficient number of the senior members of the Dental Corps to proceed to the respective camps and cantonments and assume charge of the dentists and dental property thereat.

The Dental Committee wishes me to submit the recommendation that those in charge of the planning and construction of the cantonments be informed that it is the opinion of this committee that satisfactory efficiency can be obtained only by having the dental force on duty at the cantonments grouped together in as large units as possible. The committee would recommend not less than ten dental surgeons to each group.

Not only would it be impracticable to maintain satisfactory supervision over a large number of scattered dental stations but much operating time for the dentist and training time for the men would be lost thru a lack of available patients at some stations while others were at the same time overtaxed with patients. Supplies could be more effectively controlled, many economies effected and much more efficient service rendered in general, it is considered, under the plan suggested.

The Chairman of the Dental Committee wishes to pay his tribute to the patriotism displayed by the dental profession in so generously responding to the call of the country for an adequate number of dental officers to care for the dental needs of the new army.

These results could not possibly have been accomplished without the united and harmonious efforts of the members of the Dental Committee, The Journal

of the National Dental Association, the Preliminary Dental Examiners and the members of the dental profession who have so promptly and patriotically responded to the call of their country in this war emergency.

The Surgeon General of the Army now has at his disposal 178 Dental Corps officers, 221 National Guard dental officers, and 2473 Dental Reserve Corps officers, making a total of 2878 dental officers subject to duty, a sufficient number to supply the full quota authorized by law for an army of 2,878,000. This enrollment of dental officers has been accomplished in less than five months time in spite of the fact that we had no inducements to offer the members of the dental profession other than the rank and pay of First Lieutenant.

Since these dental officers have been willing to accept service under this unjust status, I appeal to the members of the General Medical Board to lend their hearty support toward assisting the Dental Committee and the dental profession in obtaining for these patriotic members of the dental profession, all of whom are now lieutenants, the same rank that is now or may be in the future allowed to members of the medical profession without any variation whatever.

Respectfully submitted,

WM. H. G. LOGAN,
Chairman, Dental Committee.

The New York Meeting

OFFICIAL PROGRAM.

Twenty-First Annual Session of the National Dental Association

TO BE HELD IN

NEW YORK CITY

October 22, 23, 24, 25, 26, 1917.

(All sessions of the Board of Trustees, House of Delegates, General Sessions, Section Meetings, and Exhibits will be held in Hotel Astor.)

BOARD OF TRUSTEES.

MONDAY, OCTOBER 22ND.

Registration, Laurel Room, First Floor.

First Session—Board of Trustees, 11:00 A M. (Rose Room—First Floor)

HOUSE OF DELEGATES.

MONDAY OCTOBER 22ND, 2 P. M.

Opening Session, 2 P. M. All Sessions of the House of Delegates will be held in the Rose Room, First Floor.

BOARD OF TRUSTEES.

MONDAY, OCTOBER 22ND, 4 P. M.

Second Session—Board of Trustees, 4 P. M. (Rose Room, First Floor.)

FIRST GENERAL SESSION.

HOTEL ASTOR.

TUESDAY, OCTOBER 23RD, 9:30 A. M.

(Grand Ball Room—First Floor.)

Invocation.

Rev. Ernest N. Stires.....New York City.

Address of Welcome.

Hon. Marcus M. Marke, President of the Borough of Manhattan.....New York City

Mayor John P. Mitchell, on behalf of City.. .....New York City

Response to Address of Welcome.

Henry W. Morgan.....Nashville, Tenn.

President's Address.

Lafayette L. Barber.....Toledo, O.

Oration.

E. C. Rosenow (M. D.).....Rochester, Minn.

A research member of the Memorial Institute for Infectious Diseases, Chicago, and Professor of Experimental Bacteriology in the University of Minnesota and the Mayo Institute.

SECTION PROGRAM.

SECTION I.

Officers of Section.

Edgar D. Coolidge, Chairman.....25 E. Washington St., Chicago, Ill
DeLos L Hill, Vice-Chairman.....612-14 Grant Bldg, Atlanta, Ga.
J. F. Biddle, Secretary.....517 Arch St., N. S., Pittsburgh, Pa.

Operative Dentistry, Nomenclature, Literature, Dental Education and Allied Subjects.

TUESDAY, OCTOBER 23RD, 1:30 P. M.

(Grand Ball Room—First Floor.)

"Present Day Tendencies in Operative Dentistry."
By J. M. Walls.....St. Paul, Minn.
Discussed by
A. H. Hipple.....Omaha, Neb.
A. R. Starr.....New York City, N Y.
B. B. McCollum.....Los Angeles, Calif.

"The Porcelain Inlay; Its Strength and Durability."
By W. L. Fickes.....Pittsburgh, Pa.
Discussed by
A. L. LeGro.....Detroit, Mich.
C. K. Buell.....Buffalo, N. Y.
W. A Capon.....Philadelphia, Penn.

Election of officers for the ensuing year, and one delegate to the House of Delegates.

SECTION PROGRAM.

SECTION III

Officers of Section.

L. E. Custer, Chairman.....28 North Ludlow St., Dayton, O.
C. W. Mills, Vice-Chairman.....Chillicothe, O.
B. L. Shobe, Secretary.....Tulsa, Okla.

Prosthodontia, Orthodontia, Metallurgy, Chemistry and Allied Subjects.

TUESDAY, OCTOBER 23RD, 1:30 P. M.

(North Ball Room—Eighth Floor.)

"The Chemical Action of Soil Bacteria on Calcium Phosphates with the Chemical Analysis of the Human Teeth."
By J. E Hinkins.....Chicago, Ill.
Discussed by
William J. Gies.....New York City.

"Why Measurements of the Mandible, Tracings of the Condyles, the Construction of Hypothetical Triangles, and the use of the Face Bow are all non-Essential in the Construction of Dentures Possessing the Highest Degree of Efficiency"
By Dayton Dunbar Campbell..Kansas City, Mo.
(Illustrated)
Discussed by
George W. Clapp..... ...New York City.
Martin Dewey..... .....Chicago, Ill.

"The Dentist and the Clinic for Speech Defects."
By James Sonnett Greene, M. D.....New York City.
(Director of the New York Clinic for Speech Defects.)

Abst.—The close relationship between speech defects and dental anomalies can be traced almost as far back as the beginning of medical and dental history. It has been recognized that abnormal mouth and jaw conditions due to disturbance of the normal developmental mechanism and also changed mouth conditions due to artificial additions (plates, bridges, etc.) have been a potent detrimental factor affecting normal speech. While sporadic attempts have been made to correlate dental anomalies and speech disorders, yet nothing of a definite tangible nature has been instituted. Special methods of treatment for cases of defective speech due to dental anomalies. Care of patients having abnormal speech thru the malformation of the peripheral organs of speech or thru the various artificial devices. Laboratory for scientific research work demonstrating the influences on tonal speech of the various artificial substances used in the mouth A free dental bureau of information for the analysis of voice and speech defects of dental patients. —The New York Clinic for Speech Defects.

Election of officers for the ensuing year, and one delegate to the House of Delegates.

PREPAREDNESS LEAGUE OF AMERICAN DENTISTS.

Officers.

J. W. Beach, Chairman.....131 Allen St., Buffalo, N. Y.
H. A. Pullen, Vice-Chairman.....131 Allen St., Buffalo, N. Y.
M. B. Eshleman, Secretary-Treasurer.....170 Hodge Ave, Buffalo, N. Y

TUESDAY, OCTOBER 23RD, 1:30 P. M.

(College Hall—Eighth Floor.)

"Our Profession's Patriotism."
By Burton Lee Thorpe.....St. Louis, Mo.

"The Relations of the Dental Corps to the Medical Corps of the Army."
By Victor C. Vaughan, (M. D.,) Ex-President of the American Medical Association, Member General Medical Board of the Council of National Defense.....Washington, D. C.

"Motor Dental Ambulances."
By Chas. F. Ash, President of First District Dental Society, New York; Member of Committee on Preparedness League of American Dentists, Committee on Dentistry, General Medical Board, Council of National Defense.....New York City, N. Y.

"Dental and Facial Surgery in the Army."
By Major G. H Thompson, Assistant Director of Dental Services, Military District No. 6 .....Halifax, N. S.
"Report of Sectional Units of League by States—A to N inclusive."

Reports of Committees.

Election of Officers.

CROWN AND BRIDGE WORK SECTION.

Officers of Section.

K. G. Knoche, Chairman.....
.....25 E. Washington St., Chicago, Ill.
Alden J. Bush, Vice-Chairman.....
.....209 E. State St., Columbus, O.
Forrest H. Orton, Secretary.....
.....921 Lowey Bldg., St Paul, Minn

TUESDAY, OCTOBER 23RD, 1:30 P. M.

(Rose Room—First Floor.)

Chairman's Address: "An Effort to Fix a Standard of Crown and Bridge-work on the Scientific Principles Consistent with Proper Requirements."
By Karl G. Knoche.....Chicago, Ill.
Discussed by
Henry W. Gillett.....New Work City, N. Y.
Gillette Hayden.....Columbus, Ohio.
Martin Dewey.....Chicago, Ill
F. W. Frahm.....Los Angeles, Cal.
"Consideration Regarding Principles and Practice of Fixed Bridge-work."
By Alden J. Bush.....Columbus, Ohio.
Discussed by
J. K Burgess.....New York City.
E. P. Tinker.....Minneapolis, Minn.
B. B. McCullum.....Los Angeles, Cal.

Election of officers for the ensuing year, and one delegate to the House of Delegates.

HOUSE OF DELEGATES.

TUESDAY, OCTOBER 23rd, 4:15 P. M.

Second Session—(Rose Room—First Floor.)

SECOND GENERAL SESSION.

TUESDAY, OCTOBER 23RD, 8 P. M.

(Grand Ball Room—First Floor.)

RESEARCH DEPARTMENT.

Reports of Special Researches.

"Dental Caries."
By Russell W. Bunting and U. G. Rickert (B S., M. A.)
Work done in and with the assistance of, the University of Michigan.

"A Study of the Pathology of the Peridental Membrane."
By Frederick B. Noyes.
Work done in, and with the assistance of, the University of Illinois.

"The Histopathology of Chronic Periodontitis and the Pathogenesis of Dental Root Cysts."
By Arthur T. Henrici (M. D.) and Thomas B. Hartzell.
Work done in, and with the assistance of, the University of Minnesota.

"A Comparative Study of Oral Focal Infections."
By Weston A. Price and Milton J. Damlos.
Research Institute Laboratories, Cleveland, Ohio.

ASSOCIATION OF MILITARY DENTAL SURGEONS.

TUESDAY, OCTOBER 23RD, 8:00 P. M.

(First Session—College Hall.)

Association Military Dental Surgeons

SECTION PROGRAM.

SECTION II.

Officers of Section.

F. B. Moorehead, Chairman.....
.....People's Gas Bldg., Chicago, Ill.
Mark E. Vance, Vice-Chairman.....
.....407-9 Ganter Bldg., Lincoln, Neb
Virgil Loeb, Secretary.....
.....Humboldt Bldg., St. Louis, Mo.

Oral Surgery, Anatomy, Physiology, Histology, Pathology, Etiology, Prophylaxis, Oral Hygiene, Materia Medica and Allied Subjects.

WEDNESDAY, OCTOBER 24TH, 9 A. M.

(North Ball Room—Eighth Floor)

"The Action of Emetin on the White Blood Cells." (Preliminary Report.)
By Benjamin H. Schlomovitz.....Chicago, Ill.
"Is Over-filling Root Canals a Safe Procedure?"
By Elmer S. Best.....Minneapolis, Minn.
(Illustrated.)
Discussed by
Fred W. Gethro.....Chicago, Ill.
Meyer L. Rhein.....New York City.

Election of officers for the ensuing year, and one delegate to the House of Delegates.

STATE SOCIETY OFFICERS' SECTION.

Officers.

John C. Forsyth, Chairman.....
.....430 E. State St., Trenton, N. J.
H. E. King, Vice-Chairman.....
.....Bee Bldg., Omaha, Neb
C. R. Lawrence, Secretary.....Enid, Okla.

WEDNESDAY, OCTOBER 24TH, 9 A. M.

(College Hall—Eighth Floor.)

"Post Graduate Course."
By B. L. Shobe.....Tulsa, Okla.
Discussed by
Benjamin Sandy.....Minneapolis, Minn

Symposium—"Invoicing and Standardizing Our Societies."
C. R. Lawrence.....Enid, Okla.
John C. Forsyth.....Trenton, N. J.

Election of officers for the ensuing year, and one delegate to the House of Delegates.

There seems to be a general impression that this section is intended for State Society Officers only, but such is not the case.

The object of this section is to get an interchange of thought and experience for the upbuilding of our State Societies. A very large number of the State Societies are not up to the standard they should be and all members who are interested in the upbuilding of the state society are urged to attend the session of this section and take a part in its deliberations.

ORAL AND DENTAL HYGIENE.*

WEDNESDAY, OCTOBER 24TH, 9 A. M.

(Metropolitan Auditorium.)

Officers of Section.

Charles H. Oakman, Chairman.....
.....1241 David Whitney Bldg., Detroit, Mich.
J. D. Patterson.....Kansas City, Mo
L. G. Mitchell.....Oklahoma City, Okla.
H. F. Hoffman.....Denver, Colo.
B. S. Hert.....Rochester, N. Y.

"Patriotic Aspect of Oral Hygiene."
By L. G. Mitchell.....Oklahoma City, Okla.
Discussed by
B. S. Hert.....Rochester, N. Y.
George F. Burke.....Detroit, Mich.
John F. Stephan.....Cleveland, Ohio.

"Lantern Slide Talk Showing Results of Neglected Oral Hygiene."
By C. H. Oakman.....Detroit, Mich.
Discussed by
Truman W. Brophy.....Chicago, Ill.
Thomas P. Hinman.....Atlanta, Ga.
John D. Patterson.....Kansas City, Mo.

"......"
By Thomas A. Storey, College of New York City.....New York.

Election of officers for the ensuing year, and one delegate to the House of Delegates.

EDUCATIONAL EXHIBITS.

(Cosmopolitan Building)

Sidney J. Rauh, Cincinnati, Ohio, will show a series of large models, size: 18 inches, 24 inches deep and 8 inches high. These models are colored and one series depicts the progressive stages of decay; the other, results of neglect from lack of or improper brushing. A series of panels shows the results caused by neglected decay from the small cavity abscess condition and then the treatment of same. There are several other models, pictures, etc., all to be used in educating the public as to the importance of Mouth Hygiene.

This exhibit will be shown at Cosmopolitan Building.

*The Oral Hygiene Section will furnish the program for the fourth general session—see program under General Sessions. This will be a public meeting and a special invitation will be extended to members of Medical Profession, Educators, Social Workers, and others interested in Mouth Hygiene.

CROWN AND BRIDGE WORK SECTION.

WEDNESDAY. OCTOBER 24TH, 9 A. M.

(East Ball Room—Eighth Floor)

"Principles and Practice of Removable Bridge-Work."
By Frederic A. Peeso.....New York City.
Discussed by
G. Walter Dittmar.....Chicago, Ill.
Marcus L. Ward.....Ann Arbor, Mich.
George T. Gregg.....Pittsburgh, Pa.

"A Simple System of Attachment Supports for Removable Bridge-work and Its Application to Both Vital and Pulpless Teeth.
By Forry R. Getz.....New York City.
Discussed by
F. E. Roach.....Chicago, Ill.
William D. Tracy.....New York City.
Norman B. Nesbett.....Boston, Mass.

"Metallurgical and Physical Research as Applied to Crown and Bridge-work."
By Louis J. Wemstein.....New York City.
Discussed by
James H. Prothers.....Chicago, Ill.
William E. Cummer.....Toronto, Can.
Karl G. Knoche.....Chicago, Ill.

PROPHYLAXIS AND PERIODONTOLOGY PROGRAM.

The American Academy of Oral Prophylaxis and Periodontology.*

Officers.

John Oppie McCall, President.....437 Franklin St, Buffalo, N. Y.

M. H. Garvin, First Vice-President.....314 Somerset Bldg., Winnipeg, Canada.

R. R. Johnson, Second Vice-President.....Westinghouse Bldg., Pittsburgh, Pa.

J. Herbert Hood, Secretary-Treasurer.....1101 Guardian Bldg, Cleveland, O.

WEDNESDAY, OCTOBER 24TH, 9 A. M.

(Hotel Astor—Grand Ball Room.)

"Chemical Factors in Oral Immunity."
By William J. Gies.....New York City.

"A Consideration of the Physiology of the Mouth Tissues in Treating Diseases of the Same."
By Hugh W. MacMillan.....Cincinnati, Ohio

"The Rational Treatment of Pyorrhea."
By Arthur H. Merritt.....New York City.

"Dental Periclasia, Vital Points in Treatment, with Lantern Slides Showing Regeneration of Bone."
By Frank C. Pague.....San Francisco, Cal.

*The Fourth Annual Meeting held in conjunction with the National Dental Association.

RESEARCH DEPARTMENT.*

WEDNESDAY, OCTOBER 24TH, 9 A. M.

(Hotel Astor, Rose Room—First Floor.)

Reports of Special Researches.

Officers.

Weston A. Price, President.....Cleveland, O.
Harold DeW. Cross, Vice-President..Boston, Mass.
John V. Conzett, Secretary.....Cleveland, O.
Edward A Petrequin, Treasurer.....Cleveland, O.

"Root Canal Fillings."
Work done in, and with the assistance of, the Cincinnati General Hospital.

"Studies Upon the Bacteriology of Dental Caries."
By Percy R. Howe.
Work done in, and with the assistance of, the Forsyth Dental Infirmary.

"Quantitative Determinations of Certain Organic Substances in Saliva and Their Relation to Oral Conditions."
By John A. Marshall, (M. S.)
Work done in, and with the assistance of, the University of California.

"Electrolytic Medication—Physiological and Dental Aspects."
By Samuel E. Pond, (B. H,, A. M.) and Weston A. Price, Research Institute Laboratories.....Cleveland, Ohio.

*First session held as second general session See program under General Session.

SECTION PROGRAM.

SECTION I.

WEDNESDAY, OCTOBER 24TH, 1:30 P. M.

(East Ball Room—Eighth Floor.)

Election of Section Officers.

"Some Neglected Operative Perquisites."
By Fred E. Hart.....San Francisco, Calif.
Discussed by
D. P Towner.....Memphis, Tenn.
F. W. Gethro.....Chicago, Ill.
C. O. Simpson.....St. Louis, Mo.

"The Chemistry of Silicates and Their Application in Dentistry"
By C. C. Vogt (A. B., A. M., Ph D.), Mellon Institute of Industrial Research.....Pittsburgh, Pa.
Discussed by
Frank O. Hetrick.....Ottawa, Kan
C. E. Jones.....Chicago, Ill.
W. Clyde Davis.....Lincoln, Neb.

SECTION PROGRAM.

SECTION III.

WEDNESDAY, OCTOBER 24TH, 1:30 P. M.

(North Ball Room—Eighth Floor)

Election of Section Officers.

"Ionization with Special Reference to Ionic Chemistry."
By George T. Fette.....Cincinnati, Ohio.
Discussed by
Herman Prinz.....Philadelphia, Pa.
Meyer L. Rhein.....New York City.
C. T. Van Woert.....Brooklyn, N Y.

"A New Continuous Gum Set."
By Fredrick H. Nies.....Brooklyn, N. Y.
Discussed by
John F. Stephan.....Cleveland, Ohio.
L. E. Custer.....Dayton, Ohio
J. H. Pothero.....Chicago, Ill.

"Open Bite Malocclusion."
By Calvin S. Case.....Chicago, Ill.
(Illustrated.)
Discussed by
F. C Kemple.....New York City.
R. Ottolengui.....New York City.
M. H Cryer.....Philadelphia, Pa.
F. M. Casto.....Cleveland, Ohio

ANESTHETISTS SECTION.

Officers of Section.

Kurt H. Thoma, Chairman.....
.....43 Bay State Road, Boston, Mass.
S. L. Silverman, Vice-Chairman.....
.....4th National Bank Bldg., Atlanta, Ga.
Chalmer J. Lyons, Secretary.....Ann Arbor, Mich.

WEDNESDAY, OCTOBER 24TH, 1:30 P. M.

(Grand Ball Room—First Floor.)

"The Teaching of Conductive Anesthesia."
By Theo. Blum.....New York City.
(Illustrated.)

Synopsis:

(A) Necessity of practical courses for small groups of students with individual instruction and of preliminary study of the anatomy of the parts involved.

(B) Discussion of asepsis, solution and instruments

(C) Demonstration of the anatomy and also of the technic of the injections on wet specimens.

(D) Management of patients.

(E) Teaching of palpation, injection, etc., on the patient.

(F) Other adjuvants in demonstrating at the chair.

(G) Lack of success due only to neglect of the above important principles.

Discussed by
Hugh W. Mac Millan.....Cincinnati, Ohio.
Robert H. Ivy.....Milwaukee, Wis.

"The Relative Toxicity of Cocaine and Novocaine"
By Geo. R. Roth.....Washington, D. C.

Synopsis:

Relation of chemical constitution to anesthetic action. Contradictory statements in the literature relating to the toxicity of cocaine and novocaine point to the need for further study. Toxicity studies using frogs, mice, rates, guinea pigs and rabbits. Action on heart muscle, smooth muscle, the blood pressure and respiration Cause of death from novocaine poisoning. Toxicity of cocaine in man. Method of administration a factor in modifying the toxicity of either cocaine or novocaine. Individual susceptibility. Factors which should be considered in the use of cocaine or novocaine. The sterilization of solutions. Local effects of concentrated solutions. Summary.

Discussed by
J. E. Engstad.....Minneapolis, Minn.
J E. Nyman.....Chicago, Ill.

"Cause of Failure and Untoward Sequelae in Conductive Anesthesia."
By Richard H Riethmüeller..Montclair, N. J.
(Illustrated by Moving Picture Film.)

Election of officers for the ensuing year, and one delegate to the House of Delegates.

STATE SOCIETY OFFICERS' SECTION.

WEDNESDAY, OCTOBER 24TH, 1:30 P. M.

(College Hall—Eighth Floor.)

Symposium.

"Method Used in Handling the Mid-Winter Dental Clinic, Atlanta Dental Society."
By Thomas P. Hinman.....Atlanta, Ga.

"Organization."
By J. P. Luthringer.....Peoria, Ill.

"State Legislation from a Dental Standpoint."
By A. H. Reynolds.....Philadelphia, Pa.

"A General Manager for a Dental Convention as Adopted by the New Jersey State Dental Society."
By William H. Gelston.....Camden, N. J.

"Simplified Methods of the State Secretary in Expediting the Business of the State Society"
By A. P. Burkhart.....Auburn, N. Y.

"The Relation Component Societies Should Bear to the State and National Organizations."
By S. P. Cameron.....Philadelphia, Pa.

(These papers will be limited to ten minutes each, and followed by general discussion.

ORAL AND DENTAL HYGIENE.

WEDNESDAY, OCTOBER 24TH, 1:30 P. M.

(Metropolitan Auditorium)

Symposium—"Industrial Dentistry."

"Industry and the Health of the Employe."
By Arthur Williams, President American Safety Council.....New York City.

"The Effect of Dental Infection Upon the Efficiency of the Worker."
(Illustrated by motion picture.)
By Weston A. Price, President Research Institute of the National Dental Association.....Cleveland, Ohio.

"The Economic Value of the Industrial Clinic"
By T. P. Hyatt, Dental Director Metropolitan Life Insurance Company....New York City.

"The Dental Clinic in the Factory."
By Wm. R. Defield, Montgomery Ward & Company .....Chicago, Ill.

"Dental Service in the Mining Camps."
By W. A. Brierly, Chief Dental Surgeon, Colorado Fuel and Iron Company.....
.....Denver, Colo.

The speakers will be limited to thirty minute addresses, and the meeting will then be open for general discussion.

All welfare workers in industrial corporations are invited.

The industrial clinics in operation in New York City will be open for inspection in the morning of this session and a tour of them is planned.

The Industrial Session is a new departure con-

ducted under the auspices of the Oral Hygiene Section and is planned to produce better cooperation between the profession and the many industrial corporations who are giving attention to the dental welfare of the employes.

Representatives from these corporations will be present to confer with us and as a result dentistry among those engaged in the industries will receive a big "uplift." Few of us have any conception of the extensive dental service rendered to the industrial workers as this will be the first time it has been brought before us.

In the morning of this session a tour of all the Industrial Dental Clinics operating in New York City is planned. As will be seen from the following the subject will be accurately and expertly presented.

PREPAREDNESS LEAGUE OF AMERICAN DENTISTS.

WEDNESDAY OCTOBER 24TH, 1:30 P. M.

(Hotel Astor, Rose Room.)

"The Importance of Dentistry to the Modern Army."
By Colonel W. B. Clayton, Chief of the Dental Corps, Canadian Army.....Ottawa, Can.

"Stereopticon Lecture on Fractures of the Bones of the Face."
By Truman W Brophy.....Chicago, Ill.

Synopsis: This lecture will include the consideration and treatment of Gun Shot wounds; removing foreign substances; the sterilization of wounds: the proper adjustment of fragments and the means employed to mobilize them. In the treatment of injuries of the face, the primary step should be after removing foreign substances, to establish as nearly as possible, asepsis. The use of grafts of bone, modeling compound, hard rubber and metals to replace lost parts.

"The value of the Educational Work as Being Executed by the Preparedness League of American Dentists."
By Frank M. Casto.....Cleveland, Ohio.

"State Organization Work of the League."
By W. D. Tracy, Chairman First District Division, Preparedness League of American Dentists; Member of the Committee an Preparedness League of American Dentists, Committee on Dentistry, General Medical Board, Council of National Defense.....
.....New York City, N. Y.

"Report of Sectional Units by States—M to Z inclusive."

An interesting Preparedness Exhibit will be shown, including Dental Ambulance, Base Hospital, Field Hospital, and First Aid Equipments; in fact, everything relative to the service of the Dental Reserve Corps, and Red Cross.

Officers will be present to give instruction and information. The ambulance shown will be sent to France as the gift of members of the Preparedness League and appreciative patients.

HOUSE OF DELEGATES.

WEDNESDAY, OCTOBER 24TH, 4:30 P. M.

Third Session, (Rose Room—First Floor.)

THIRD GENERAL SESSION.

WEDNESDAY, OCTOBER 24TH, 8 P. M.

(Grand Ball Room—First Floor.)

Herbert L. Wheeler, Chairman.....New York City

Dental Surgery and Restorative Prosthesis in the European War.

Symposium—"Dental Surgery and Restorative Prosthesis in the European War."

"War Dental Surgery."
By .....

"War Dental Restorative Prosthesis."
By .....

It is expected that Mr. Robert Bacon, Ex-Embassador to France, will preside, and that the Surgeons General of both the Army and Navy will attend. A description of the work done in Europe will be given by one who has had experience there.

It is anticipated that both the Medical and Dental Professions will be represented.

There will also be pictures of "War Surgery."

SECTION PROGRAM.

SECTION II.

THURSDAY OCTOBER 25TH, 9 A. M.

(North Ball Room—Eighth Floor.)

Election of Section Officers.

"Reconstructive Surgery of the Face and Jaws During Peace and War."
By Morris I. Schamberg.....New York City.
(Illustrated with Lantern Slides.)

Discussed by
F. H. Albee.....New York City
Major V. P. Blair.....St. Louis, Mo.
W. L. Shearer.....Omaha, Neb.

"The Explanation of Certain Misleading Things We See in Dental Radiographs."
By Howard R. Raper.....Indianapolis, Ind.

Discussed by
F. D. Miller.....Altoona, Pa.
Clarence O. Simpson.....St. Louis, Mo.
J. R. Caughron.....Oklahoma City, Okla.

RESEARCH DEPARTMENT.

THURSDAY OCTOBER 25TH, 9 A. M.

(Grand Ball Room—First Floor.)

Reports of Special Researches.

"Dental Cements."
By Marcus L. Ward.
Work done in, and with the assistance of, the University of Michigan.

"Progress of the Investigation of Mottled Enamel."
By Frederick S. McKay, Colorado Springs, Colo
(Illustrated.)

"Studies of Internal Secretions in Their Relation to Development and Condition of the Teeth."
By William J. Gies, (M. D, Ph D.)
Work done in, and with the assistance of, the Columbia University.

"The Relative Efficiency of Medicaments for the Sterilizing of Tooth Structures."
By Matilda Moldenhauer Brooks (A. B., M. S.) and Weston A. Price, Research Institute Laboratories.....Cleveland, Ohio

ORAL AND DENTAL HYGIENE.

THURSDAY OCTOBER 25TH, 9 A. M.

(Rose Room, Hotel Astor—First Floor.)

(1) "Dental Prophylaxis." A dental film showing the system and technic advocated for the use of the dental hygienist.

(2) "The Dental Hygienist." A New Vocation for Women. Showing the work of the dental hygienist in the educational and preventive dental clinic in the public schools of Bridgeport, and also the dental hygienist in the offices of private practitioners.

(3) "Mouth Hygiene for United States Soldiers." Showing a corps of twenty dental hygienists giving prophylactic treatments and instruction in the use of the tooth brush to soldiers.

By Alfred C. Fones.....Bridgeport, Conn.
(Motion Pictures.)

Discussed by
N. S. Hoff.....Ann Arbor, Mich.
Frederic R. Henshaw.....Indianapolis, Ind.

"Film Instruction for Personal Mouth Hygiene, Accompanied by School Drill."
By M. L. Rhein.....New York City.
Discussed by
A. H. Stevenson.....New York City.
H. J. Burkhart.....Rochester, N. Y.

"Dental Publicity."
By H. C. McKittrick.....Indianapolis, Ind.
Discussed by
C. O. Simpson.....St Louis, Mo.
Sidney J. Rauh.....Cincinnati, Ohio.

"Oral Hygiene in the Public School Curriculum."
By A. H. Stevenson.....New York City.
Discussed by
C. Ward Crampton, Director Physical Training, Board of Education.....New York City.
W. W. Belcher.....Rochester, N. J.
A. C. Fones.....Bridgeport, Conn

ANESTHETISTS SECTION.

THURSDAY OCTOBER 25TH, 9 A. M.

(East Ball Room—Eighth Floor)

"After-pain in Local and General Anesthesia."
By A. E. Hertzler.....Kansas City, Mo.
Discussed by
Leo Stern.....New York City.
Don M. Graham.....Detroit, Mich.
Wm. J. Lederer.....New York City.

"General Anesthesia for Oral Surgery."
By Herbert A. Potts.....Chicago, Ill.
Discussed by
Truman W. Brophy.....Chicago, Ill.
Morris L. Schamberg.....New York City.
Wm. L. Shearer.....Omaha, Nebr.

CLINIC PROGRAM.

Clinic Officers.

Oliver W. White, Chairman.....406 Fine Arts Bldg., Detroit, Mich.
C. R. Lawrence (Illustrated Clinics)....Enid, Okla.
Alden J. Bush (Removable Bridge and Root Canal Work).....Columbus, Ohio.
Carl D. Lucas, (Oral Surgery).....902 Hume Mansur Bldg., Indianapolis, Ind
Edward Kennedy, (Local Arrangements).....347 Fifth Ave., New York City.

The Clinic Committee of the National Dental Association has arranged for an illustrated Lecture Clinic, a Progressive Clinic and Surgical Clinic under Conductive and General Anesthesia.

RULES FOR CLINIC.

Members and Guests should procure their clinic tickets immediately following registration.

Tickets will be issued at Clinic Headquarters, Astor Hotel.

Each person will be entitled to two tickets, one for Thursday afternoon, and the other for Friday morning sessions.

Kindly make selection of clinic sections you wish tickets for, before applying at headquarters This will facilitate matters.

Tickets will be issued only on personal application. Mail orders will not be honored.

Clinics start promptly at two o'clock Thursday, and nine o'clock Friday morning.

In justice to the clinicians who have, at a great expense of time and energy, prepared these clin-

ics, doors will be locked and no interruptions will be permitted, once the clinics have started.

Conductors and ushers will be in charge of the different clinic sessions

THURSDAY OCTOBER 25TH, 9 A. M.

ORAL SURGERY CLINIC.

Carl D. Lucas, Director.

(New York City Hospitals.)

Operations under Conductive and General Anesthesia will be held in the City Hospital before such audiences as the four operating rooms put at our disposal will accommodate. Clinicians and operations they will perform if suitable cases can be secured are as follows:

"Cleft Palate and Harelip."
By Chalmers J. Lyons.....Ann Arbor, Mich.

"Neurectomy of Branch of Fifth Nerve."
By Charles H. Oakman.....Detroit, Mich.

"Cleft Palate and Harelip."
By Truman W. Brophy.....Chicago, Ill.

"Cleft Palate and Harelip."
By Wm. L. Shearer.....Omaha, Neb.

"Cleft Palate and Harelip."
By F. B. Moorehead.....Chicago, Ill

"Extraction of Impacted Third Molars."
.....

"Root Resection"
.....

"Removal of Impacted Third Molars"
By C. F. B. Stowell.....Chicago, Ill.

CLINIC PROGRAM.

PROGRESSIVE CLINICS.

Crown and Bridge Work and Root Canal.

THURSDAY, OCTOBER 25TH, 2 P. M., and FRIDAY, 9 A. M.

(Hotel Astor, Parlors E, F, G, H, I, K—Eighth Floor.)

ROOT CANAL SECTION.

A. J. Bush, Director.

1.

Carl J Grove.....St. Paul, Minn.
"Multi-Canaliculated Roots."

2.

Elmer S. Best.....Minneapolis, Minn.
"Root Canal Filling."

3.

Geo. T. Fette.....Cincinnati, Ohio.
"Electrolytic Treatment of Root Canals."

4.

George C. Sharp.....Pasadena, Calif.
"Ionization"

5.

Frederick E. Hart, Director..San Francisco, Calif.
"System in Operative Procedures."
Contribution by G. V. Black Club of University of California, showing Charts and Models for teaching purpose in connection with club's work.

ILLUSTRATED CLINICS SECTION.

Under the Direction of C. R. Lawrence.

THURSDAY, OCTOBER 25TH, 2 P. M., and FRIDAY, 9 A. M.

(Hotel Astor, Grand Ball Room.)

(All clinics in this section will be illustrated in detail by motion pictures or stereopticon slides).

1.

"Important Nerve Blocking Injections for Oral Surgery and Major Dental Operations."
By Arthur E. Smith.....Chicago, Ill.

2.

"Root Amputation and Other Surgical Operations Upon the Maxillae and Teeth."
By A Berger.....New York City

3.

"Simple, yet Effective Means of Making Attachment to Vital Teeth for Removable Bridge Work and Partial Plates."
By G Walter Dittmar.....Chicago, Ill.

4.

"Gold Inlay Technic."
By B. B. McCollum.....Los Angeles, Calif.

5.

"The Physical Effects of Ionization on Diseased Apical Tissue, Illustrated by Colored Lantern Slides made by the Lumere and Paget Processes."
By R. Ottolengui.....New York City.

*This Friday clinic will be held at Hotel Astor, Rose Room.

OPERATIVE SECTION.

The Forsyth Clinic Club.

THURSDAY, OCTOBER 25TH, 2 P. M., and FRIDAY, 9 A. M.

(Claridge Hotel, Ball Room.)

Under the direction of Percy R. Howe.

"A Method of Sterilizing and at the Same Time Impregnating Affected Dentinal Tissue with a Metal"

1—S. J. Burke.
2—E E. Johnson,
3—Rafidin Ahmed.
4—J. H. Jaffar.
5—F. T. Bowen.
6—N. H. Finkelstein.

DETROIT CLINIC CLUB.

(Only organized Clinic Clubs have been invited to give Clinics.)

First District Society, Detroit.

Oliver W. White, Pres. Edgar L Giffen, Rec. Sec.

DIRECTORS.

Edward B. Spalding	William A. Giffen
Henry C. Raymond	Albert L. LeGro
Marcus L. Ward	Russel W. Bunting

Charles H. Oakman

CLINICIANS.

William H. Elliott	William A Matheson
Charles Lane	Edgar L. Giffen
J. Melville Thompson	B. O. Sabin
Raymond L. Girardot	L. F. Burlingame
Bert R. East	George W King
Harry S. Bailey	A. J Hall
Wilbert J Whitman	Louise Pagelson
Albert J. Norman	Sigurd Becker
Oscar Manthey	Clarence C. Parker
Chalmer J Lyons	William J. Meier
Ira A. Lehman	J. Longe
P. C. Lowery	Elmer Whitman
William Northrup	Don M Graham
Harry Black	J. J. Travis
Frank C Cole	Charles P. Wood
Lloyd Rogers	Ruth S. Matheson
William P. Gibson	F. Ward Holt
A. F. Summers	Grace R. Spalding
Howard L. Jones	George C Bowles
Charles A. Ross	Harold Slocum
Louis G. Watkins	C A. Thompson

INLAY SECTION.

The Technic of the Impression and Model Method for Gold and Porcelain Inlays and Crowns.

Detroit Clinic Club.

THURSDAY, OCTOBER 25TH, 2 P. M, and FRIDAY, 9 A. M.

(Hotel Astor, North Ball Room and Room M—Eighth Floor.)

Edward B. Spalding, Director.

1.—"Principles in Handling the Impression Material. The Use of the Matrix"
(Impressions of occlusal, buccal, cervical, and Mesial-occlusal-distal cavities.)
Edward B Spalding.

2.—"Impressions of Cavities in Incisors and Cuspids.
George William King.

3. Impressions for Porcelain Jacket Crowns and Its Modifications and Accurate Articulation for Them.
Charles A. Ross.

4.—"Preparation of the Impression, Investing and Packing with Amalgam."
Howard L. Jones.

5.—"Mounting of Models for Contract and Occlusion."
Sigurd Becker.

6.—"Principles of Cavity Preparation for Porcelain Inlays. Carving for Anatomical Restoration."
Wilbert J Whiteman.

7.—"Burnishing Matrices for Porcelain Inlays"
Albert J. Hall.

8.—"Building in of Foundation Body."
Edgar L. Giffen.

9.—"Laying on and Blending of Colors in Enamels."
William J Meier.

PROSTHODONTIA SECTION.

Detroit Clinic Club.

THURSDAY, OCTOBER 25TH, 2 P. M, and FRIDAY, 9 A. M.

(Hotel Astor, College Hall and Rooms A, B, C, and L—Eighth Floor.)

Under the Direction of William A. Giffen and Elmer L. Whitman.

1.—"Preliminary Impressions and Their Significance."
Frank W. Holt.

2.—"Preliminary Models and Their Individual Impression Trays."
J. Longe

3.—"Test Impression Upper Dental Arch"
Charles Lane

4.—"Test Impression Lower Dental Arch."
William A Matheson.

5.—"Taking Bite Recording Condyle Path and Mounting on Articulator."
Louis C. Watkins.

6.—"Working Models. Try in Plates and Bite Rims"
Lloyd Rogers.

7.—"Selection of Teeth Trubyte System."
P. C. Lowery.

8.—"Arrangement of Teeth to Produce Normal Balance."
Elmer L. Whitman.

PORCELAIN CROWN SECTION

Detroit Clinic Club.

THURSDAY, OCTOBER 25TH, 2 P. M., and FRIDAY, 9 A. M.

(McAlpin Hotel, Winter Garden.)

Albert L. LeGro, Director.

CLINICIANS.

B. O Sabin	Harold S. Slocum
Harry Black	W. P. Gibson
J. Melville Thompson	A F. Summers
C. G. Parker	C. A. Thompson
Arthur Norman	Calvin L. Shafer

Symposium:
1.—Diagnosis.
2.—Prognosis.

3.—Preparation.
4.—Impressions.
5.—Definite Models.
6.—Definite Seating of Models.
7.—Amalgam Models.
8.—Definite Articulated Occlusion of Models.
9.—Making Cement Models.
10.—Making of Matrices.
11.—Making of Cement-jackets.
12.—Making of Synthetic Porcelain Crowns.
13. No. 40 Tin Articulation Matrices
14.—Packing of Porcelain.
15.—Agitation of Mass for removal of moisture.
16.—Producing shades.
17.—Definite approximation.
18.—Carving.
19.—Definite occlusal surfaces and planes.
20.—Definite finished work produced without the necessity of grinding after final bake

CROWN AND BRIDGE SECTION.

Detroit Clinic Club.

THURSDAY, OCTOBER 25TH, 2 P. M., and FRIDAY, 9 A. M.

(Hotel Astor, East Ball Room)

Marcus L. Ward, Director.

1.—"Showing Two Kinds of Hand Carved Porcelain Crowns."
William H. Elliot.
2.—"Showing Goslee, Plate, and Dowel Crowns."
L. E. Burlingame.
3.—"Showing Cast Cups and Seamless Gold Crowns."
Ira A. Lehman
4.—"Showing Two Kinds of Richmond Crowns."
John J. Travis.
5.—"Showing Setting up of Bridge Parts and Investing Bridges."
H. S. Bailey.
6.—"Showing Completed Fixed Bridges."
Frank C. Cole.
7.—"Showing Inlay Attachments and Removable Bridges."
Marcus L. Ward
8.—"Showing Use of Steele's Facings."
R. Walter Priest.

PREVENTIVE DENTISTRY SECTION.

Detroit Clinic Club.

THURSDAY, OCTOBER 25TH, 2 P. M., and FRIDAY, 9 A. M.

(McAlpin Hotel, Ball Room.)

Russel R. Bunting, Director.

1.—"Malocclusion as a Cause of Periodontal Diseases."
Charles P. Wood.
2.—"Colored Models Representing Various Stages of Gingivitis."
Louise M. Pagleson.
3.—"The Technic of Preventive Dentistry for Children."
Heartha Chartwig.
4.—"Methods of Polishing Enamel Surfaces."
Ruth S. Matheson.
5.—"Preparation of Root Surfaces."
George C. Bowles.
6.—"Instruction of the Patient."
Grace R. Spalding.
7.—"Dentifrice."
William P. Northrup.

REMOVABLE BRIDGE WORK SECTION.

Frederick A. Peeso, Director.

THURSDAY, OCTOBER 25TH, 2 P. M., and FRIDAY, 9 A. M.

(College of Oral and Dental Surgery, 302 East 35th St.)

Time to be occupied by each Clinician will be twenty minutes. Clinicians and subjects they will present are as follows:

1.
Frederick A Peeso.....New York City.
"....."
Frank W. Peeso.....New York City.
"....."
Edwin W. Hardin.....New York City.
"....."
William S. Prensky.....New York City.
"....."
Forry R. Getz.....New York City.
"....."
John W. Scherer.....New York City.
"....."
George T Gregg.....Pittsburgh, Pa.
"....."
Louis J. Weinstein.....New York City.
"....."

THE CHAYES DENTAL CLUB.

MOVABLE, REMOVABLE BRIDGE WORK.

The Chayes Dental Club.

THURSDAY, OCTOBER 25TH, 2 P. M., and FRIDAY, 9 A. M.

(New York College of Dentistry, 205 East 23rd Street.)

Philip Hussa, Director.

CLINICIANS
(To be Announced.)

HOUSE OF DELEGATES.

THURSDAY, OCTOBER 25TH, 4:15 P. M.

Fourth Session, (Rose Room—First Floor.)

FOURTH GENERAL SESSION.

THURSDAY, OCTOBER 25TH, 8 P. M.

(Grand Ball Room—First Floor.)

Oral and Dental Hygiene—Mass Meeting.

Charles H. Oakman, Chairman.....Detroit, Mich.

"Address."

By Governor Martin G. Brumbaugh.....
..... Pennsylvania.

"The Importance of Dental Infection as Related to Urinary Tract Diseases, with Particular Reference to Ureter Stricture and Its Sequelae"

By Guy L. Hunner (S. B., M. D.) Johns Hopkins University.....Baltimore, Md.

Discussed by

Major Wm. H. G. Logan.....Chicago, Ill.

A. I. Folsom (M. D.).....Dallas, Texas.

An invitation is extended to the Medical Profession, Teachers and other Educators who are interested in Oral and Personal Hygiene to attend the evening session.

CLINIC PROGRAM.

FRIDAY, OCTOBER 26TH, 9 A. M.

The illustrated lecture clinics and the progressive clinic given on Thursday, 2 p. m., will be repeated, except illustrated lecture clinic, which will be held in Rose Room.

LAST GENERAL SESSION.

FRIDAY, OCTOBER 26TH, 3:00 P. M.

(East Ball Room—Eighth Floor.)

Installation of Officers.

LIST OF EXHIBITORS.

The American Dentist.....
.....9 South Clinton St., Chicago, Ill.

American Surgical Specialty Co.....
.....6 East Lake St., Chicago, Ill.

The Albodon Co...154 W. 18th St., New York City.

American Cabinet Co., The.....Two Rivers, Wis.

Julius Aderer.....47 W. 42nd St, New York City.

American X-Ray Equipment Co.....
.....401 East 31st St, New York City.

American Standard Sterilizer Co.....
.....287 Broadway, New York City.

Adams X-Ray Co.....
.....1737 Woodward Ave., Detroit, Mich.

Baker & Co.....Newark, N. J.

Claudius Ash, Sons & Co., Ldt.....
.....1 Union Sq., New York City.

The Bacon Mfg. Co.....
.....701 Donaldson Bldg., Minneapolis, Minn.

Borine Mfg. Co., 551 West 42nd St., New York City.

Campbell Electric Corp.....Lynn, Mass.

The Columbus Dental Mfg. Co.....
.....Wagner & Jackson, Columbus, Ohio.

A. C. Clark & Co.....76th St. & Greenwood Ave., Grand Crossing, Chicago, Ill.

Cleveland Dental Mfg. Co...Cleveland, O.; Philadelphia, Pa, & 18 East 41st St., New York City.

Columbia X-Ray & Electric Corp.....
.....131 East 23rd St., New York City.

Colgate & Co., Established 1806.....
.....185 Hudson St., New York City.

Consolidated Dental Mfg. Corp.....
.....130-134 Washington Place, New York City.

The L. D. Caulk Co.....
.....Milford, Del., and Philadelphia, Pa.

The I. J. Dresch Laboratories.....Toledo, Ohio.

DeVilbiss Mfg. Co.....Toledo, Ohio

Detroit Dental Mfg. Co.....
.....20-22 Milwaukee Ave. W., Detroit, Mich.

The Dental Specialty Co.....
.....1638 California St., Denver, Colo

Denver Chemical Mfg. Co.....
.....57 Twight St, New York City.

The Dentists' Supply Co.....Candler Bldg., Times Square, 220 West 42nd St, New York City.

Electro Dental Mfg. Co.....
.....1224 Cherry St., Philadelphia, Pa.
(Office and Factory, 23rd and Arch Sts.)

Edwards X-Ray Mfg. Co.....Indianapolis, Ind

Farbwerke-Hoechst Co., The.....
.....111 Hudson St., New York City

Friedman Brothers.....Marshall Field Bldg., 22 E. Washington St., Chicago, Ill.

Fischer & Co., H.....
.....708 Lexington Ave, New York City.

Foregger & Co., Inc.....
.....33 West 42nd St, New York City.

The Heldbrink Co.....
.....525 South 4th St., Minneapolis, Minn.

Horlick's Malted Milk Co.....Racine, Wis; 207 West 98th Street, New York City.

Harvard Co., The.....Canton, Ohio.

J. W. Ivory.....21 N. 13th St., Philadelphia, Pa.

H. D. Justi & Co.....
Chicago, Ill., & 1301 Arch St, Philadelphia, Pa.

J. F. Jelenko & Co.....
.....1 Union Square, New York City.

Jacob Petry Retainer Co.....
.....2022 Lowrie St., Pittsburgh, Pa.

The Kolynos Co.....New Haven, Conn.

Kiander Lang Co., Inc.....
.....220 West 42nd St., New York City

J. W. Lyon & Sons, Inc.....
.....520 West 27th St., New York City

Lochead Laboratories, Inc.....
.....109 West 42nd St., New York City.

The Lennox Chemical Co.....
.....1207 E. 55th St., Cleveland, Ohio.

Lavoris Chemical Co.....Minneapolis, Minn.

The J. Bird Moyer Co., Inc .....1212 Vine St., Philadelphia, Pa.
Simon Myerson, D. M D.....615 Massachusetts Ave., Cambridge, Mass.
Morgan Hastings & Co.....819 Filbert St., Philadelphia, Pa.
J. M Ney & Co.....Hartford Conn.
The Oakland Chemical Co.....10 Astor Place, New York City.
Pepsodent Co., The.....1104 Wabash Ave, Chicago, Ill.
The Pelton & Crane Co.....244-56 Harper Ave., Detroit, Mich.
The Charles H. Phillips Chemical Co .....London, Eng.; 128 Pearl St., New York City.
The Ritter Dental Mfg. Co.....Rochester, N. Y., and 200 5th Avenue, New York City.
The Ransom & Randolph Co .....514 Jefferson Ave, Toledo, Ohio.
A. P. DeSanno & Son.....1252 North Broad St., Philadelphia, Pa
Stratford-Cookson Co.....42nd and Ludlow Sts., Philadelphia, Pa.
Lee S Smith & Son Mfg. Co.....Keenan Bldg., Pittsburgh, Pa.
I. Stern Dental Supply Co.....1 Union Square, 30-32 East 14th St., New York City.
Samuel G. Supplee & Co .....1 Union Square, New York City.
20th Century Dental Broach Co.....Cleveland, Ohio, and 220 West 42nd St., New York City.
Vulcan Coil Co .....239 S. Los Angeles St., Los Angeles, Calif.
Victor Electric Corporation.....Chicago, Ill., and 131 East 23rd Street, New York City.
Weissfeld Brothers.....332 Broad Way, New York City
The Weber Dental Mfg. Co.....Canton, Ohio.
Waite & Bartlett Mfg. Co.....252 West 29th St., New York City
Wappler Electric Co., Inc.....173 East 7th St., New York City.
Washington Drug Products Co., Inc.....510 West 139th St, New York City.
S. S. White Dental Co.....Chestnut and Twelfth Sts., Philadelphia, Pa.

THE JOURNAL of the NATIONAL DENTAL ASSOCIATION

Entered as second-class matter, March 22, 1915, at the Post Office at Huntington, Indiana, under the Act of August 24, 1912. Published Monthly.

Editor and General Manager.
OTTO U. KING. D. D. S., Huntington, Indiana.

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Office of Publication, Huntington, Indiana.

All expressions of opinion and all statements of supposed facts are published on the authority of the writer over whose signature they appear and are not to be regarded as expressing the views of the National Dental Association, unless such statements or opinions have been adopted by vote of the Association.

SUBSCRIPTION included in the annual membership dues.

SUBSCRIPTION PRICE, $2.00 a year, in advance, to non-members, living in all parts of the United States or its Possessions. Canada, $2.40. Foreign countries, $2.75.

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RENEWAL BILLS are sent one month in advance. Prompt attention to them prevents discontinuance from the mailing list. Journals are not sent beyond the subscription period.

VOL. 4 OCTOBER, 1917 No. 10

Editorial Department.

A REASONABLE COURSE TO PURSUE IN THE TREATMENT OF PULPLESS TEETH.

The dental profession has long sought for a safe and reliable method for cleansing, sterilizing, and filling root canals. That the essential necessities for success have been little understood is evidenced by the widely diversed methods followed by men in different parts of the country, and also because of the enormous percentage of failures revealed

by the X-ray. The facts recently developed by the research commission showing the universality of infections of root ends of pulpless teeth are unquestioned and many dentists and physicians have accepted them as final and have adopted the forceps as a cure for infections of all pulpless teeth. This is indeed unfortunate and unwarranted. The assumption that infections occurring about the ends of pulpless teeth are blood borne from distant parts of the body is also without foundation; first, because routine blood cultures in a large number of cases of individuals who have had dental abscess infection about the ends of pulpless teeth have failed to reveal bacteria in the blood stream; second, because the bacteria found in the chronic dental granuloma is by all cultural methods proven to be the same type of bacteria as that which is found on the surfaces of teeth, and all the facts in the case point to the pulp canal and pyorrhea pocket as the ports of entry thru which these bacteria enter and affect lodgment in the apical areas. One of the most reliable pieces of work done to solve the problem of the channel of root infection is that of B. Mayrhofer of the University of Innsbruck, under the title of "Klinisch-bakteriologische Untersuchungen zur Pathologie und Therapie der faulen Zahnpulpa. Jena, 1909, 1910. Wiener klinische Wochenschrift, 21, 615." Mayrhofer found that the constant inhabitant of the deep portion of the root canal to be the streptococcus. He also found that teeth might be treated by the Buckley method, formalin cresol, or Schreier's sodium and potassium and apparent sterility would be gained, but if the canals were filled by the ordinary methods and with the ordinary type of root canal filling material, that in a course of a very few weeks removal of the root canal filling and culture would reveal growth in the apices of the previously filled roots. He, therefore, made the deduction that sterilization of the extreme root ends had not been accomplished and that after a period of incubation had been allowed to elapse, the bacteria became numerous enough to yield positive culture. He, therefore, adopted the method of filling the root ends with Perubalsam, an adhesive varnish, which he believed penetrated the bases of the tubules, and efficiently prevented the further growth of any streptococci left in the root tips, thereby greatly increasing the percentage of his successes in filling the roots of pulpless teeth.

An examination of several hundred root tips obtained and examined under aseptic precautions by Hartzell and Henrici confirm Mayrhofer's view that the infectious micro-organism causing dental abscesses is resident in the root end itself. Therefore, the problem of successfully sterilizing and filling root canals is to be solved by adopting methods that effectively destroy the bacteria in the tips of the canal as well as in the pulp chamber. That this can be done has been amply proven by the

work of Callahan, Rhein, Best, and others, and it is therefore indeed unfortunate that the Dental Cosmos in its editorial columns should give utterance to the view that the old and sloppy method of root canal filling with cotton should have any standing in court. It is the belief of the editors of this journal that root canal operations should be conducted with exactly the same aseptic precautions in the way of clean instruments, clean materials, clean hands, and sterility of the canals themselves that are expected of the general surgeon in opening a brain or removing an appendix, and that where the dentist adopts these methods from start to finish in his root canal work, teeth so treated will remain in the jaws and do service with entire safety to the patient. The accumulating evidence of the past two years shows conclusively that it is possible to open the root tips of canals, sterilize and fill them, and even permit a quantity of chlora percha to extrude thru the root end without permanent damage to the tissues beyond. The evidence thus far collected shows that the temporary damage wrought by the use of powerful antiseptics or the extrusion of root canal filling material when sterile is rapidly repaired without permanent damage to the tissues, and the teeth so treated remain in a safe and healthy condition. The rapidly increasing number of radiographic histories of abscessed teeth that have been sterilized and treated by the Callahan method with subsequent amputation of the root ends shows conclusively that if the root itself be sterile, no matter what the trauma at the root end by operation has been, new bone is built into the area vacated by removal of the root tip and diseased tissue. The Callahan method is an improvement on the Mayrhofer method in that it gives us a material which is very sticky and at the same time intensely penetrating, enabling it to flow into and seal the bases of tubules which have been emptied of fibriles by chemical methods, thus preventing the possibility of procreation of streptococci which may have escaped the action of chemical agents employed to sterilize the canals. Callahan's formula, it will be remembered, is thirty-two grains of the finest resin to the ounce of chloroform.* the canal being filled with the chloroform resin mixture with a hard gutta percha point thrust into it, churning it up and down until the gutta percha is dissolved in the canal after which additional points are driven firmly home. All such canals should have the pulp chamber third filled with the most impervious cement obtainable to effectually prevent bacteria gaining entrance to the canal from the pulp chamber.

Hartzell and Henrici have collected a large series of radiographic records of teeth which were treated as follows:

*To this solution, Conzett adds 10 grams of aristol to cause the filling to cast an X-ray shadow.

First, the dead pulps were removed with barbed broaches and dioxogen.

Second, the pulp canals were treated by churning into them Schreier's sodium and potassium in order to sterilize and dissolve the fatty material.

Third, the root canals were washed out with alcohol in order to free them from the soapy sodium potassium hydrate.

Fourth, the canals were flushed with C. P. sulphuric acid.

Fifth, the canals were dried out with dry cotton.

Sixth, the canals were filled by the Callahan method.

Seventh, was the process of apecoectomy.

The development of bone follows providing the root is sterile and the diseased tissue is all removed.

DENTAL STUDENTS AND THE DRAFT—ARMY DENTAL SERVICE.

With the development of knowledge of focal infections, the practice of dentistry is very gradually moving to a position of increasing importance in the practice of internal medicine and surgery. Today the careful physician does not undertake the treatment of any one of a considerable group of diseases without first searching for and eliminating, if possible, all localized chronic infections, which are clearly recognized as causal to such diseases; the surgeon, except in cases of emergency, does not operate until such chronic infections are cleared up, thus reducing the danger of post operative infection. In proportion, as chronic focal infections are eliminated will diseases and surgical complications resulting from such infections be reduced, and since the mouth is the region most prolific in chronic foci, the elimination of these foci becomes the highest type of preventive practice. The next natural step will be the prevention of such foci by the more intelligent application of dental treatment.

Reports from the hospitals which are caring for the British and French armies indicate that about forty per cent. of all disabilities are medical, largely of the group resulting from focal infections, and that the wounds of many, especially wounds of the face and head, which constitute the large majority, are complicated by the presence of abscessed teeth. Careful tabulations of radiographic examinations show that more than fifty per cent. of persons of draft age have definite infections of the maxillary bones adjacent to the teeth, and there is little doubt but that fully ninety per cent. of the men now assembling in the various cantonments thruout the country have teeth so badly decayed

that abscesses are practically certain to develop within a year or less, if the teeth are not well cared for.

This all means that our new army should have its teeth put in order while it is in camp in this country, so that there will be the minimum of disease and suffering and of wound complications on the other side. While we praise the spirit and work of the dental colleges thruout the country, and of the Preparedness League of American Dentists, for their patriotic efforts to care for the mouths of the men entering the army, the time per man is too brief to permit of the type of service to which the men are really entitled as a health measure. The army should have at least one dentist to each five hundred while in the cantonments, regardless of the number who may be needed overseas.

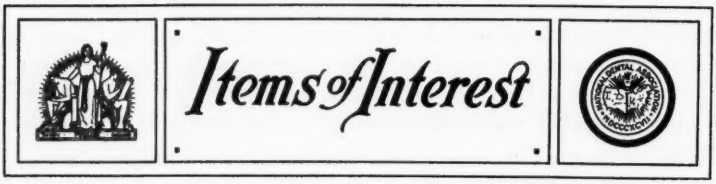
On August 29th, an order was issued which permits hospital internes and fourth, third and second year medical students to enlist in the Enlisted Reserve Corps, with the understanding that they will be permitted to complete their studies and then enter active service in the Medical Corps. **The Secretary of War saw fit to except dental students from this order, because he thought dental service for the army was not of sufficient importance to justify him in permitting dental students to continue their studies.**

This decision by the Secretary of War definitely separates dentistry from medicine as an important branch of army service. It means that our army is not to have the advantage of the dental service to which it is entitled. The decision means also that, should the war continue, the number of dentists will be so reduced that our civilian population can not have proper dental service.

Statistics show that the inclusion of dental students in the draft will reduce the number of graduates from all dental colleges in the United States for the next five years to about 6,000, as compared with 12,500 for the past five years. This will be a severe blow to the advancement of the science of dentistry, for it must result in reduced efficiency by those who are in practice. In Canada, the total number of dentists has already been reduced one-fifth, and in England and France many cities are practically without dental service. Our schools are a necessary part of the system which makes for the progress of the profession, and it is to be hoped that orders may yet be issued which will permit them to continue under such conditions that at least a reasonable output of graduates will be maintained.

DENTAL RESERVE CORPS OFFICERS RELEASED FROM SERVING AS PRIVATES

Telegram from Surgeon General Gorgas, October 2, 1917: "Advise drafted dental reserve corps officers, who have accepted commissions and are being sent to the camps as privates, to write or wire to this office, care of Major Logan, for proper official forms granting them release from military calls until assigned to active duty as dental officers." GORGAS.



"EXODONTIA."

By Carl D. Lucas, D.D.S., Indianapolis, Ind.

(Read before First District Dental Society, Detroit, Mich., November 10, 1916, and Englewood, Ill., Dental Society, Chicago, November 14, 1916; St. Louis Dental Society, November 16, 1916; Indianapolis Dental Society January, 1917; Fort Wayne Dental Society, March 14, 1917.)

The subject of Exodontia Technic has received very little consideration for the past ten years, with the exception of that for the removal of impacted lower third molars.

The Dental Profession is greatly indebted to a member of the Michigan State Dental Association for the most logical and practical technic ever introduced for the surgical removal of impacted teeth.

The original method of employing the mallet and chisels for resecting the superimposed bone from the crown and root base of such teeth has at least seven advantages over the use of the dental burr for this purpose:

First. The operation may be performed much more expediently.

Second. Heat, which is produced by the friction of the revolving burr upon bone, which in many cases is a contributory cause of osteoperiosteitis is eliminated.

Third. The danger of laceration of the surrounding gum tissue by losing control of the burr, is precluded.

Fourth. The less complicated instrument, the chisel, is more easily sterilized than is the hand piece and burr.

Fifth. The contention that these oprations are major surgical operations. therefore should be performed in the hospital, has given the Oral Surgeon his just rank and position as a skilled operator in the opinion of the Medical Profession and the Laity at large.

After the tooth has been removed, all lose spicules of bone should be curetted from the wound and the socket dehematized and tincture of iodine applied in the socket.

The posterior portion of the wound in the gum should then be closed with two or more horsehair sutures.

By replacing the tissues over the exposed bone, the blood clot which forms is maintained in-situ, protecting the traumatized bone from the saliva and mouth flora. Owing to the antiseptic properties of the clot, we eliminate, to a great degree, the post operative osteodynia which otherwise would ensue if the clot were not protected by fixing the tissue with sutures.

The anterior portion of the wound

should be left open for drainage, or lightly packed with one-half inch sterile gauze, moistened with Tincture of Benzoin Compound. The gauze should be removed within twenty-four hours and the wound gently irrigated with warm normal saline solution.

In most cases we have not found it necessary to repack the wound, but in cases where severe trauma has been produced in operation, a Tincture of Benzoin Compound gauze pack inserted into the anterior portion of the wound seems to control, to a degree, the post operative pain.

Warm normal saline solution should be used by the patient as a mouth wash every two hours for two days following the operation and three times a day thereafter until the wound is entirely closed.

The sutures should be removed the fourth or sixth day, according to the degree of healing of the individual case.

Sixth. By performing these operations in the hospital, where we have the assistance of a trained anesthetist, we are able to concentrate our energy upon operative technic, eliminating the danger the patient was formerly subjected to when the dentist administered the general anesthetic and also performed the surgical operation.

Seventh. Local or conductive anesthesia are surely contra-indicated on account of the nervous strain the patient must undergo, consequently general anaesthesia, which by all means should be employed in surgical cases in hospital routine only, is necessarily the anesthetic of choice.

The writer would therefore express the appreciation of the entire Dental Profession to Dr. Chalmers J. Lyons for his most valuable contribution and the perfection of a technic par excellence for the surgical removal of impacted teeth.

We would offer an amendment to this operation which has proven a source of inestimable value to the patient in the post operative period.

It is essential to the operator that he have an unobstructed view of the field of operation while resecting the superimposed bone from the tooth, prior to its removal.

By block dissection, therefore we remove the overlying gum tissue from the bone before we resort to the use of the chisels.

Since Dr. Lyons has previously very definitely described and demonstrated his technic before this society, it would be a repetition to go into detail in that regard.

ADVANTAGES.

First. Retention of antiseptic blood clot over the traumatised bone area, protecting the operated field from ingress of saliva and mouth flora.

Second. Rapid closure of the wound by first and third Intention.

Third. Lesser amount of scar tissue.

Fourth. Lesser degree of osteodynia.

Fifth. Lesser amount of Osteoperiostitis.

The gratifying results obtained by closing such a wound after the removal of impacted teeth led the writer to employ a similar technic, following the extraction of other than impacted teeth.

Previously to the employment of this procedure the writer, in his general practice of dentistry, was often discouraged by the apparent misfit of full or partial dentures, owing to the inability of the operator or patient to properly seat the denture on account of pain or irritation produced by the plate resting upon sharp margins of the orifices of tooth sockets, or jagged spines of process which remained after the necessary fracture of the alveolar process during the extraction of ankylosed teeth, especially those of the senile patient.

The modus operandi which entirely eliminates such apparent failures in prosthesis is as follows:

PREPARATION OF PATIENT.

After anesthetization is complete and the patient placed in a recumbent po-

sition the patient is draped with a sterile sheet which completely covers the body and the arms of the operating chair, or the operating table. A sterile towel is fixed around the hair, the face and lips are then thoroly sponged with 70 per cent alcohol then another sterile towel is adjusted under the chin and pinned over the head, leaving only the nose, cheeks and lips exposed.

The mucous surfaces of the lips and cheeks, the teeth to be operated, and the tongue are then sponged with 70 per cent alcohol and dry, sterile sponges or cotton rolls are packed labially or buccally and lingually to the teeth to be removed.

Tincture of iodine is then lavishly applied to all surfaces of the crowns of the isolated teeth which are to be extracted.

SURGICAL TECHNIC.

An incision is made thru the gum and periosteum to the process, approximately one-half of a millimeter immediately to the labial and buccal of the free gingival margin of the gum.

The periosteum which supports the superimposed gum tissue is elevated with a periosteotome from the outer alveolar plate.

The condemned teeth are then extracted with forceps. If they are found to be ankylosed, the outer alveolar process should be chiseled from the roots of the teeth to their apical third. The teeth may then be removed labially or buccally with chisels, elevators or forceps without danger of fracturing the process.

If cryptic pyogenous prophylactic membrane at the apices of roots are present they should be thoroly curetted and the crypts thoroly sponged with tincture of iodine, followed with 70 per cent alcohol.

An incision should be made approximately one millimeter to the lingual of the linguo-gingival gum margin, eleaving the periosteum which supports the gum tissue, to a point one millimeter beyond the alveoli.

The inter-approximal gum tissue is dissociated from the interseptal process, and this process is chiseled, burred rongeured or curetted to uniform proportions, or the probable point of normal resorption and the labial and buccal process conformed to the interseptal bone.

Carefully remove all loose fragments of bone from the individual sockets and sponge the process with 70 per cent alcohol.

The periosteum and gum tissue which formerly covered the outer and inner plates of process should then be brought into contact and sutured to place with interrupted horsehair sutures, cutting close to the knots, which should rest above the suture line.

By frequently changing the sponges during the operation, all saliva will be absorbed so it will not invade the field of operation.

If the operation is performed in a dental surgical operating room the saliva injector may be used to advantage.

The sutures should be placed at sufficiently close intervals to definitely close the wound and the blood clot, being thereby protected, the bone will be sealed from the ingress of germ laden saliva.

The periosteum is necessarily brought into apposition over the bone by the sutures, thereby coming into its normal environment.

Instead of resorption of the process following this operation, osteoblastic functional activity is stimulated, consequently the alveolar ridge will be built up to symmetrical, rounded proportions.

Healing by first intention within four to six days will be complete and at that time the sutures may be removed.

Either the right or left side of the upper or lower jaw should be operated and sutured before the opposite side of the same jaw is begun. By this procedure the operator can maintain a saliva free field of operation.

Either conductive or general anesthesia may be administered for this operation. If conductive anesthesia should be elective the operation may be performed

in office routine, however the most strict rules of surgical cleanliness must be followed. If general anesthesia is preferable to the patient and operator, the work must be done in the hospital, where surgical technic is obvious.

ADVANTAGES.

First. The elimination of sharp margins of the alveoli and pointed spines of alveolar process.

Second. Permanent dentures may be constructed and inserted within six to ten days following the extraction of the teeth.

Third. Dentures may be firmly seated the day of their insertion without irritation to the gums.

Fourth. Eliminates the necessity for scraping relief in dentures over the ridges, thereby impairing their fit.

Fifth. Resorption of process practically eliminated.

Sixth. Accessibility to abscess crypts and ease of curettment of pyogenous membrane.

Seventh. Ankylosed teeth may be extracted without danger of fracturing the process.

Eighth. Post operative pain minimized by closing the wound and preserving the blood clot, thereby precluding infection from the saliva.

The writer has operated 18 upper and 12 lower jaw cases, removing all of the teeth, and 26 cases of partial extractions within the past twenty months by the above method. All of these cases have had full or partial dentures or bridges inserted within from four to twelve days after extraction.

All of the dentures, which were properly constructed, are more perfectly fitting and satisfactory at this time than they were one month after insertion.

The ridges are smooth, full, firm, rounded out and symmetrical.

This technic is especially advantageous in the anterior portion of the upper and lower jaws where bridges or partial dentures are to be supplied. The teeth may be placed at the proper angle cervico incisally, because the outer alveolar place has been resected, thereby permitting the proper alignment of the artificial substitutes and subsequent resorption is minimized.

Formerly the Dentist was satisfied to extract chronically abscessed teeth, thinking that the drainage thereby established would be adequate for the elimination of the infection and that the pyogenous membrane would either atrophy or be physiologically resorbed.

Since the advent of dental radiography we have learned that such is not the case.

Radiographs made of the edentulous jaws of a patient who came under the observation of the writer nine months after her Dentist had extracted all of her remaining teeth, neglecting the curettment of the sockets which contained abscessed teeth, showing the pyogenous membrane encrypted in the process.

This patient's teeth were extracted in this case to relieve her of focal infection which was ascribed etiologic of endocarditis lenta. The heart lesion, after nine months, did not improve materially after the simple extraction of the diseased teeth.

This patient was operated at the expiration of that time for the removal of the cryptic infection. Two months after this operation the heart lesion was materially improved and at present the patient is practically free from cardiac symptoms.

We have had many patients wearing full upper and lower dentures who were suffering from arthritis, have their jaws X-rayed and we have found focal infection present. Following the surgical curettment of such crypts these patients have been permanently relieved of such sequelae. This proves that the extraction of abscessed teeth without the curettment of the pyogenous membrane will not eradicate oral foci of infection.

If the radiograph demonstrates a pyogenous membrane which is twice the

diameter of the root base of the tooth, it cannot be entirely curetted thru the socket. Therefore we would advocate that a crescent shaped incision be made from two to four millimeters above the gingival line upon the buccal or labial surface of the gum and the pyogenous membrane be curetted from the socket thru the outer alveolar plate, sponging the crypt with Tincture of Iodine, then suturing the gum and periosteum to place.

If the pyogenous membrane is less in diameter than the root base, the crypt may be curetted thru the socket.

In either instance we would insist upon the application of the most strict rules of asepsis in this operation.

As proof that asepsis can be maintained in mouth operations, we would report that specimens taken and cultures made therefrom in all our cases of curettage of pyogenous crypts within the past six months, grow pure cultures only.

Aseptic Dentistry of the not far distant past was a travesty as compared with Aseptic Surgery.

Formerly the Dentist sterilized only the blades of his instruments. Later he sterilized the entire instruments but neglected his engine hand pieces, and he did not sterilize linens nor thoroly scrub and sterilize his hands, nor did he cover the patient's clothing, the hair, the head rest and the chair arms with sterile towels or sheets, nor attempt to sterilize the patient's face before beginning the operation.

If we contemplate the adoption of the above outlined methods of oral Surgical procedure we must rigidly adhere to the rules of surgical cleanliness. Not only should this rule be adopted in surgical procedure, but if we are to command the respect of our Medical Brothers we must improve our methods of asepsis in all Operative Dental procedures, especially in pulp canal technic.

Our office assistant must be trained in surgical technic and when practical, should be a trained nurse, especially if we attempt surgical operations in our offices.

The General Practitioner of Dentistry can perform the above outlined operations successfully if he will follow the rules advocated in this paper, and from our past experience his prosthetic results will prove a source of satisfaction and pleasure if he will carefully follow the details in these outlined new methods of Exodontia Technic.

THE SWORD OF DAMOCLES.

By William Colby Rucker, M. D., Assistant Surgeon United States Public Health Service.

It was hot and sultry in the rooms of the County Medical Society and the general sleepiness of the atmosphere was not in any way relieved by the droning voice of Dr. Erasmus P. Hicks dilating on the superiority of goat's milk for artificial feeding. A few of the older men who felt themselves above criticism boldly stalked out to the cool of the antechamber and one by one the youngsters trickled thru the door, leaving behind only the occupants of the first three rows and those who had fallen asleep in their chairs.

In the outer room Marcus was holding forth, an alienist of international reputation, noted for a taciturnity which sometimes broke its bonds with the rush of a spring freshet.

"I tell you it gets 'em every time—sooner or later a man has to pay. You fellows see the beginnings of things—

the finding of the indictment, as it were —I see the endings—the execution of the sentence. And, God, what punishments! Not only does the man who breaks the law of nature suffer—if that were all it wouldn't be so bad—but the mental and physical agony of the family, yes, and of the generations yet unborn, is something unbelievable. The cruelty of it all! You know how it is; sometimes after a short bodily inconvenience, often not enough to be called an illness, they go on for years in fancied security, even forgetting perhaps, the sin of long ago. And then the concrete pavement begins to feel like a plush carpet beneath the foot, the gait becomes uncertain in the dark, the lightning pains begin to rend the victim—you know the symptoms. Maybe its a constant headache; and a round of oculists and internists and sanitariums begins. Then one day something breaks the fine fiber of self-restraint and 'Change wonders at his absence until the Court appoints a conservator and the name of the asylum comes out.

"Let me illustrate. I can tell it now because he's long since dead and the family all live in Europe on his money. About two years before the fire, I was called into the case as a consultant. Clear case of paresis—in my own mind I didn't give him a year. Asked usual questions about previous history—patient claimed good record—denied any wrong doing and was upheld in this by the family physician who said they had been intimate for twenty years. Still, it didn't look right to me. I knew the doctor wouldn't lie about it and the patient acted like he was telling the truth. But it piqued my curiosity and afterwards I used to catch myself wondering about it and debating whether I was unjust to the man.

"Well, he got so it wasn't safe to keep him at home so we sent him to Boardman's. One day his wife came into the office to talk about the case; you know how they do; and in some way it came out that the patient had toured Europe about a year before his marriage. This was a new aspect of the case to me so I let her gabble on. She told me what an extensive trip it had been and that he had kept a most minute diary during the entire time, but that she had never been allowed to read it. I felt at once that I must have that book. At my request she searched the house for it—couldn't find the thing anywhere—had his private papers at his office gone over—not a single trace of it. I was considerably put out—made me sore to lose such a chance of proving up and settling the worth of a deduction I believed correct.

"Just as I had about given up and told my curiosity it was an old meddler to start me on such a fool's errand, Boardman writes me that he found a greasy old note book on the patient when he was admitted and that any attempt to take it away from him always made him violent. It was the diary—I knew it instinctively—and I didn't lose any time in getting out to the asylum. Well, after a lot of wheedling I got the book, a little dog-eared, dirty volume written full of the account of that journey. It wasn't an easy job to read it tho. The grease had soaked thru and the faded letters in that methodical business hand didn't stand out very plain on the yellow paper. But I knew I had a human document containing the answer to the question which had perplexed me so long.

"The beginning was about like that of any diary. Resolves to make journey before finally settling down—BON VOYAGE dinners—journey to New York—sailing of ship—waving friends on pier—all that sort of thing. Makes an acquaintance on board, young man about his own age—decide they will make the tour together. Cherbourg—Paris—rather gay time—a Mlle. Louise Louis joins party and the three travel thru Norway, Sweden, and Denmark together, finally winding up in Berlin about two months after the diary begins. Here is the first rift in the lute—the apple has turned to ashes —he feels sick, consults a doctor—is sent

to Fournier in Paris. You know what that means. The diary reads, 'Saw Dr. Fournier today. I am to return in ten days for my sentence.' Poor ignorant boy, little did he realize the meaning of that sentence even after it had been delivered. From that time on the course of the disease was that of a typical light form, apparently yielding perfectly to treatment—a treacherous viper waiting until it can strike the most telling blow, biding its time until success has crowned years of labor and brought the pleasant anticipation of retirement from active life into the calm and peace of the family home.

"In three or four months the young man thinks he is cured, leaves Paris, completes his tour, and, after a year's absence, returns to New York. That day he made this entry (how it sticks in my mind) 'And thus today ends my WANDERJAHR—a period of great profit, much pleasure, and nothing to look back to with regret.' How little impression this awful thing had made on his ignorant young mind! He had already forgotten the worst thing which was to happen to him in all his life. And in the after years nothing occurred to recall it, but always a sword hung above his head. Only one of his sons reached manhood, his only daughter was a chronic invalid, and he sometimes wondered at the puniness of his grandchildren. But he did not see in this the punishment for the sin of his youth nor did he realize the price he was to pay for this season of apparent immunity. All the time he remained well, pushing his way up the narrow ladder of success, accumulating wealth, gaining civic honors, respected, looked up to, no one apparently so much to be envied. And then the blow fell; but God was kind—he scarcely lived out the twelve month"

There was silence for a moment and then one of the youngsters blurted out: "Wonder what happened to the chum?"

"Well, I did too. So I went carefully thru the book again and found his full name and address. I know him well. He's been in a rolling chair with locomotor ataxia for the past fifteen years, suffering the pains of hell." — *Social Hygiene.*

VENEREAL DISEASE IN CHRISTIANIA.

It is, perhaps, too much to hope, for the immediate future anyway, that our country will adopt any system of compulsory notification of venereal disease. Perhaps in time a city here and there will adopt it, and upon its success in such progressive communities will depend its extension to the nation-at-large. If some enthusiasts will brand us as ultraconservative in this matter, at least we have the support of the chief European powers in our attitude. Here and there, however, thruout the civilized world, countries are beginning to adopt measures looking to the safeguarding of their citizens from these insidious and prevalent dangers. Frequently we find the progressive offspring of conservative parent welcoming such public health measures, as witness Australia. Then, to jump nearly the length of the globe, there is Christiania, which has been reporting venereal diseases since 1876.

In the report of the medical officer of health, Dr. Yngvar Ustvedt, for 1915, there are reported 2,424 new cases of venereal disease. This is more than twice as many as were reported in 1876, but since that year the population of Christiana has more than tripled. In other words, the percentage of venereal disease to the population has fallen from 1.28 to .96. The percentage of syphilis itself has fallen from .53 to .25 per cent.

It is not probable, from what we know of lues, that these figures represent an actual decrease in the prevalence of the disease. It is more likely that with the advent of the Wassermann reaction and other diagnostic refinements many cases were definitely decided not to be syphilis, but chancroid or some skin disease. The day has gone by, we hope never to return, when the medical student learned two kinds of skin disease, eczema and syphilis, and every case was certain to be either one or the other.

Doctor Ustvedt's report mentions that during the year seven women were convicted in the courts of knowingly exposing others to the infection. It does not mention how many men were brought to trial who were directly responsible for complete hysterectomies. —*New York Medical Journal, Jan. 6.*

AN OPINION OF SPECIAL INTEREST ON THE ADMINISTERING OF ANESTHETICS.

An opinion of especial interest to dentists thruout Ohio was handed down by Attorney General McGhee, Friday, at the request of Dr. W. I. Jones, of the State Health Council, who has requested it to clear up a very general misunderstanding.

In his opinion, Mr. McGhee holds that dentists who hold proper certificates are entitled to administer anesthetics both in the practice of dentistry and otherwise as occasion may arise.

Sometime ago an opinion, which was popularly construed to confine such service to doctors of medicine, was given out.

To quote all the law bearing on the subject, Attorney General McGhee says, "I advise you that a person who has a certificate to practice dentistry in the state of Ohio is permitted to administer anesthetics, not only in the exclusive practice of dentistry, but also when otherwise properly required to do so.

"In Opinion No. 528, rendered by me on August 14, 1917, I held that the giving of the various drugs to produce anesthesia, when surgical operations are being performed, constitutes the practice of medicine under the provisions of the medical laws of this state and therefore could not be given by persons not admitted to the practice of medicine, but the question raised in this opinion as the exemption of a dentist was not before me and was not answered in that opinion."

EXEMPTION OF MEDICAL STUDENTS.

The President has issued regulations which will have the effect of exempting from the draft, though continuing them liable to military service, all hospital internes and medical students in the second, third and fourth years. At the same time the President indicated that no nation-wide rules would be made for the exemption of men in any special industry.

It has been settled that the draft will not generally affect labor conditions, and such specialists in vital industries as cannot be spared will be exempted by the local boards—*Army and Navy Register.*

CAVINA, C.: FORCED AND PERMANENT OCCLUSION OF THE JAWS AS A METHOD OF TREATMENT IN MAXILLARY FRACTURES.

Stomatol, Milano, 1916, xiv, No. 6. (Abstract.)

In the service for the treatment of wounds of the jaw directed by Beretta in the military hospital at Bologna a method of treatment has been adopted which consists of forced occlusion of the jaws by means of metal ligatures. Cavina states that this is well borne by the patients and that not a single case of muscular or articular constriction has occurred even in patients who have had their jaws immobilized for two or three months; but to avoid any such complication the appliance is removed from time to time for several hours. Cleanliness is maintained by means of antiseptic irrigation and the use of the toothbrush. The method is employed in simple fractures with displacement of fragments; as comminutive fractures; in fractures with loss of substance; in cases of bony or cartilaginous grafts. In simple fractures immobolization is to be practiced immediately; in open fractures and in cases with loss of substance it is necessary to await disappearance of suppurative and necrotic processes.

The apparatus used consists of two cast metallic gutters with small buttons soldered in the vestibular side, these being placed in a verticle line with each other or alternating according as it is desired to make separate ligatures or a continuous ligature with a single metallic thread. The gutters are cemented to the teeth under local or general anesthesia if the reduction of the fragments is painful. If the two jaws cannot be brought together at once, it is necessary to proceed, gradually tightening the wires more every day. The patient can take liquid food thru the retomolar space, or thru space remaining after loss of teeth. When consolidation of the fragments is obtained the ligatures or removed, leaving the gutters in place some days longer.—*W. A. Brennan, Surgery, Gynecology and Obstetrics.*

ESSER, J. F.: STUDIES IN PLASTIC SURGERY OF THE FACE.

Ann. Surg. Phila., 1917, lxv., 297. (Abstract.)

The author has had extensive experience with plastics of the face and mouth in war hospitals and has obtained gratifying results in many cases by a special technic which he describes chiefly by means of illustrations. He has developed a new technic in the application of Thiersch grafts, which consists of making an exact impression with dental wax previous to the operation which secures a firm contact of the graft with its bed and is kept in place until the graft is taken. The lifting of the graft under special aseptic technic and with care to obtain an even thickness is of great importance. He found the skin on the inner side of the upper arm to be the most satisfactory, being thin and elastic.

Owing to faults in translation the author's technic for securing grafts is not clear. His use, however, of a wax impression to insure a smooth line of the graft in concave surfaces seems to be an advance in the technic of skin-grafting. —*Horace Binney, Surgery, Gynecology and Obstetrics.*

THE SOCIAL DISEASES—THE CALL TO FACE FACTS.

Knowledge with regard to the evils and the sores of our social conditions is of the utmost value and use when it can lead to action or can by producing sane and wise thinking influence conduct and public opinion. But it would be foolish to deny that there are dangers in the indiscriminate distribution of knowledge. For knowledge is dangerous when it leads to panic and hence to rash and ill-considered action to avert the evils disclosed; it is dangerous when it leads to morbid absorption in horrors, to rash judgments, to a loss of the sense of proportion, to want of charity.

We have awakened to the recognition of a great evil. Women are beginning to understand what the double standard of morals means. Men are being forced to face the fact that it leads not only to the ruin and degredation of vast numbers of girls and women, but to widespread and terrible disease. Ignorance, blindness, and weak acceptance of sin as a necessity have long prevented us from facing this evil, but it can be ignored no longer. It affects society as a whole, it affects the position of women, it affects the relationship between men and women, it affects the very future of the race itself.

The facts must be faced, but they must be faced in a wise and sober spirit which will enable us to understand their true bearing. On the spirit in which we face an evil that we are determined to fight must largely depend the possibility of real success in the fight. In this matter, just because it concerns both men and women so intimately, men and women must fight together. It is not a question of one against the other; but both must fight for the common good against a state of things which, because it is disastrous for society as a whole, is equally disastrous for men and women, and the responsibility for getting rid of it must rest upon both.— *The Social Disease and How To Fight It.*

AN ACT PROVIDING FOR THE EDUCATION AND EXAMINATION OF DENTAL HYGIENISTS.*

Be it enacted by the Senate and House of Representatives in General Assembly convened:

Section twelve of chapter 316 of the public acts of 1915 is amended to read as follows: Any registered or licensed dentist may employ women assistants, who shall be known as dental hygienists. Such dental hygienists may remove calcareous deposits, accretions and stains from the exposed surfaces of the teeth and directly beneath the free margins of the gums, but shall not perform any other operation on the teeth or mouth, or on any diseased tissues of the mouth. They may operate in the office of any registered or licensed dentist or in any public or private institution under the general supervision of a registered or licensed dentist. The dental commission may revoke the license of any registered or licensed dentist who shall permit any dental hygienist operating under his supervision to perform any operation other than that permitted under the provisions of this section. On or after July 1st, 1917, no dental hygienist shall be permitted to practice who has not registered with the recorder of the dental commission unless such person shall pass an exami-

*New section of the Connecticut dental law which refers to the dental hygienist. This section goes into effect July first.

nation prescribed by the dental commission. The fee for such examination shall be ten dollars. Any applicant failing to pass such examination shall be entitled to a reexamination at the next meeting of the commissioners, without additional cost, and for any other additional examination a fee of five dollars shall be paid. The dental commission shall make such rules and regulations as may be necessary for the examination of dental hygienists. Said commission may issue its certificate to any applicant therefor who shall furnish proof satisfactory to said commission that she has been duly licensed to practice as a dental hygienist in another state after full compliance with the requirements of its dental laws, provided her professional education shall not be less than that required in this state. The dental commission may revoke the registration and license of any dental hygienist violating any provision of this act.

A WISE APPOINTMENT.

It will be gratifying news to people of the nation who are interested in seeing that the army cantonments are kept clean to know that Colonel L. M. Maus, Medical Corps, U. S. A., has been sent on an inspection tour of the localities in which such army camps are to be established. Colonel Maus on his visits is meeting in conference civic bodies, city, county and army camp officers and discussing ways and means to strictly carry out the War Department's orders with reference to keeping the surroundings of the camps clear of vice. He is quoted as saying that he considers vice diseases, alcoholism and general immorality the greatest menace that confronts the army today, and has expressed his determination to eliminate them if possible.—*American Issue.*

Books Received

Books received are acknowledged in this column, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

Dental Metallurgy—For the Use of Dental Students and Practitioners. By Ewing Paul Brady, D. D. S., Published by Lea & Febiger, 706-10 Sansom Street, Philadelphia, Pa. Price $2.50.

Dental Materia Medica and Therapeutics.—With special reference to the Rational Application of Remedial Measures to Dental Diseases. A text book for students and practitioners. By Herman Prinz, A. M., D. D. A., M. D., Professor of Materia Medica and Therapeutics, The Thomas W. Evans Museum and Dental Institute School of Dentistry University of Pennsylvania; formerly Professor of Materia Medica, Therapeutics, and Pathology, and Director of the Research Laboratory, Washington University Dental School, St. Louis. Fifth edition. Enlarged and revised according to the United States Pharmacopeia, Ninth Decennial Revision.

Modern Dental Materia Medica Pharmacology and Therapeutics.—By J. P. Buckley, Ph. G., D. D. S. Professor and Head of the Department of Materia Medica, Pharmacology and Therapeutics, formerly Director of the Chemical Laboratories, Chicago College of Dental Surgery. Third edition, fifth printing. Revised and enlarged. 72 Illustrations, octavo; XIII+395 pages. Cloth, $2.50 postpaid. The work is divided into two parts. The first is devoted to Materia Medica and Pharmacology, with enough Therapeutics to indicate clearly the uses of the various drugs and remedies; and an effort has been made to include every drug or remedy which is employed in Dental Therapeutics. This part of the book contains Prescription Writing, and its associated subjects, Metrology, Medical Latin, and Incompatibility, all of which subjects have been given the dignity and importance they deserve.

The second part of the book is devoted to Practical Dental Therapeutics.

Published by P. Blakiston's Son & Company, 1012 Walnut St., Philadelphia, Pa.

Dental Physiology and Oral Hygiene.—By David Stanley Hill, D. D. S., First edition, Illustrated.—The LeCrone Press, Effingham, Illinois, 1917.

A Manual of Dental Prosthetics, Third and Revised Edition, by George Henry Wilson, D. D. S. Price $4.50. Published by Lea & Febiger, 706-10 Sansom Street. Philadelphia, Pa.

The Mouth and Teeth, the Song of the Toothbrush.—By Maude Muller Tanner, Portland, Ore. Price, $1.00 per copy, large numbers 75c.

NATIONAL SOCIETIES.

National Dental Association, New York City, October 22-26.

National Association of Dental Faculties—New York City, October 19 and 20.

National Association of Dental Examiners, New York City, October 22-23.

Xi Psi Phi Fraternity, New York City, October 22, 1917.

Association of Military Dental Surgeons, New York City, Oct. 23-26.

STATE SOCIETIES.

November.

Arizona—Phoenix, November.

December.

Ohio—Cleveland, December 4, 5, 6.

ASSOCIATION OF MILITARY DENTAL SURGEONS OF THE UNITED STATES

The Association of Military Dental Surgeons of the United States, will hold its first session on Tuesday, October 23, at 8:00 P M., in College Hall, Hotel Astor, New York City. A special invitation to attend this meeting is extended to all members of the Army Dental Corps as well as to all dentists who have taken the examination for the Dental Reserve Corps.

The program for this association's meetings will be of special interest to all of those interested in the various Army and Navy Dental Corps. No dentist who has taken the examination or who has been commissioned in any of these Corps can afford to miss any part of the program which will be rendered by the Association of Military Dental Surgeons.

OTTO U. KING, General Secretary.

SECURE YOUR HOTEL RESERVATIONS.

The Hotel Astor is unable to furnish any more rooms. The Association is indebted for courtesies to the Hotel McAlpin and the Hotel Claridge, who are supplying us without charge with rooms for meetings and clinics. We therefore urge those who can conveniently do so to make reservations at one of these hotels if they have not already reserved rooms elsewhere.

Cordially yours,

R. OTTOLENGUI,

Chairman, Publicity Committee.

NOTICE TO A. P. H. A. MEMBERS.

The annual meeting of the American Public Health Association will be held at Washington, D. C., Oct. 17-20, 1917. The chairman of the Local Arrangements Committee urges all members to make hotel reservations early, and to secure positive bookings in writing. Any railroad or hotel can furnish a list of Washington hotels. Further announcements will be issued later.

Yours truly,

A. W. HEDRICH, Acting Secretary.

NEBRASKA BOARD OF DENTAL EXAMINERS.

The Nebraska Board of Dental Examiners will hold a regular meeting in Omaha, November 6-7-8-9 at the Creighton Dental College. For information address Dr. S. A. Allen, Sec'y, Loup City, Nebraska.

SOUTH DAKOTA STATE BOARD OF DENTAL EXAMINERS.

The South Dakota State Board of Dental Examiners will hold its next examination at Sioux Falls, S. Dak., beginning January 7th, 1918. All applications must be in the hands of the Secretary by January 1st. Fee $25.00. Address

ROBERT JASMANN, Secretary,
Scotland, So. Dak.

COLORADO STATE BOARD OF DENTAL EXAMINERS.

The Board of Dental Examiners of the State of Colorado, will meet in Denver, Colorado, Tuesday, December 4th, 1917, at 8 a. m. for examination of applicants for license to practice dentistry in the State of Colorado.

In addition to the written examination, applicants must supply their own patients, instruments and materials, and come prepared to do practical work under the supervision of the Board.

All applications must be in the hands of the Secretary not later than December 1, 1917.

For application blanks and information, address R. C. QUICK, Secretary,
310 Metropolitan Bldg.,
Denver, Colo.

PSI OMEGA FRATERNITY.

All members of Psi Omega attending the National Dental Association will find headquarters provided at the Hotel Astor during the week of the convention. **Please register immediately upon arrival.**

The annual meeting and banquet of the Fraternity will be held at the Hotel Astor, Friday evening, October 26th, 1917.

H. M. POTTER,
Secretary, Reception Committee.

ORAL HYGIENE.

Our Industrial Session.

"If America is to retain her industrial supremacy after the war, the human factor of the labor problem must be met and solved at once. This is not sentiment. It is business necessity. This country has outstripped Europe for many years in mere production of commodities. We have led the world in administrative and executive skill, in the organization and financing of material projects. In salesmanship, also, Europe has little to teach us and in problems of delivery and transportation our methods have easily been supreme, and yet in the sum total of efficiency, we have found it difficult to compete with many European countries, simply because we have neglected the human side of the labor problem.

"If America is going to hold her present supremacy, American employers must learn that they cannot afford to waste human life. We can't afford to have dead workers. We can't afford to have sick workers. We can't afford to have resentful, discontented, undernourished or underpaid workers, and we can't afford to have unhappy workers."

These are the sentiments of Mr. Arthur Williams, President of the American Museum of Safety, who is to open the Industrial Session at the National meeting on the afternoon of October 24th.

The Industrial Session is a new departure conducted under the auspices of the Oral Hygiene Section and is planned to produce better cooperation between the profession and the many industrial corporations who are giving attention to the dental welfare of their employes.

Representatives from these corporations will be present to confer with us and as a result dentistry among those engaged in the industry will receive a big

"uplift." Few of us have any conception of the extensive dental service rendered to the industrial workers as this will be the first time it has been brought before us.

In the morning of this session a tour of all the Industrial Dental Clinics operating in New York City is planned. As will be seen from the following, the subject will be accurately and expertly presented.

Wednesday, October 24th, at 1:30 P. M., Auditorium, Metropolitan Life Insurance Co., I Madison Ave., New York City, N. Y.

Symposium.—"Industrial Dentistry."

Mr. Williams, President, American Museum of Safety, New York City, N. Y.

"Industry and the Health of the Employee."

Dr. Weston A. Price, President, Research Institute of the National Dental Association, Cleveland, Ohio.

"The Effect of Dental Infection Upon the Efficiency of the Worker." (Illustrated by motion pictures.)

Dr. T. P. Hyatt, Dental Director, Metropolitan Life Insurance Co., New York City, N. Y.

"The Economic Value of the Industrial Dental Clinic." (Illustrated.)

Dr. Wm. F. Defield, Montgomery Ward and Co., Chicago, Ill.

"The Dental Clinic in the Factory."

Dr. W. A. Brierly, Chief Dental Surgeon, Colorado Fuel and Iron Co., Denver, Colorado.

"Dental Service in the Mining Camps." (Illustrated.)

The speakers will be limited to thirty minute addresses, and the meeting then be open for general discussion.

All welfare workers in industrial corporations are invited.

ALBERT H. STEVENSON,
Chairman, Oral Hygiene Committee, of the Local Committee of Arrangements.

NATIONAL DENTAL ASSOCIATION.

Transportation Arrangements to 21st Annual Session, New York, N. Y., October 22-26, 1917.

Those who are going to New York for the National Dental Association meeting October 22nd to 26th are urged to consult the local ticket agent at their home town for complete information regarding fares, time limits and stop-over privileges in connection with the trip. There is on file in every ticket office the tariff schedule which officially informs local agents of the rates from that point.

You should not leave the determination of the route desired until just before you are ready to start on the trip. Local Ticket Agents may have to obtain special tickets for this occasion from their general offices, and you must therefore notify them in time so that the tickets will be available when you are ready to commence your journey.

From various points in the United States, passenger associations have announced special rates as follows:

Central Passenger Association: This comprises the territory of the lower peninsula of the State of Michigan. All territory as far South as the Ohio River, as far East as Buffalo and Pittsburgh, and as far West as a direct line drawn between St. Louis and Chicago. Two cents per mile in each direction. Signature form of tickets will be sold October 19th, 20th, and 21st, final return limit to reach the original starting point not later than midnight, October 30th. A joint tariff authorizing fares for the annual session of the Association from points in the Central Passenger Association territory has been compiled.

For your information, I am giving you herewith, round-trip rates authorized for our meeting from the principal points in the Central Passenger Association territory to New York and return.

Battle Creek, Mich.....$29.25

Bay City, Mich.	28.00
Chicago, Ill.	36.30
Cincinnati, Ohio	30.10
Cleveland, Ohio	22.90
Columbus, Ohio	25.30
Dayton, Ohio	28.10
Detroit, Mich.	26.50
Grand Rapids, Mich.	30.55
Indianapolis, Ind.	32.50
Jackson, Mich.	27.45
Kalamazoo, Mich.	30.15
Saginaw, Mich.	27.50
South Bend, Ind.	32.10
Springfield, Ohio	27.10
St. Louis, Mo.	42.20
Terre Haute, Ind.	35.40
Toledo, Ohio	26.50

The Trunk Line Association: This serves most of New York, Pennsylvania, New Jersey, Delaware, Maryland and West Virginia, also a part of Virginia, and announces that there will be available for those attending the coming session of the National Dental Association, a railroad rate of two cents per mile in each direction with minimum of $1.00 for the round trip on the certificate plan, going and returning via same route only. Going tickets in connection with certificates to be sold October 19th, 20th and 21st at one-way fares applicable to New York City on the certificate plan. These certificates must be obtained from the Ticket Agent at the starting point, and to be valid for reduced fares returning, must be indorsed by the Secretary of the National Dental Association, indicating that the holder has been in attendance at the meeting and is entitled to the reduction, and must also be validated by a special agent on either October 24th, 25th or 26th. Return tickets will be sold on presentation of validated certificates October 24th-29th at the difference between the fares paid on the going trip and the fares for the round trip; these latter tickets to be limited to continuous passage to destination, which must be reached in no case later than October 30th.

New England Passenger Association: Two cents per mile in each direction, short line mileage, going and returning via same route, and that one over which one-way tickets are regularly sold, and only from points where regular one-way fare to New York City is over $1.00. Tickets to be sold or certificates issued and good going October 19th, 20th and 21st, and returning to reach original starting point not later than midnight of October 30th.

Trans-Continental Passenger Association: Summer rate tickets from North Pacific Coast points may be purchased as late as September 29th, return limit October 31st.

Chicago and return	$ 80.00
St. Louis and return	77.50
New York and return	118.20

Regular nine months excursion fares, approximating two cents per mile in each direction, are in effect daily from California and North Pacific points.

From California to Chicago and return	$110.00
From California to St. Louis and return	103.00
From North Pacific points, Chicago and return	109.00
From North Pacific points, St. Louis and return	103.50

Western Passenger Association and Southwestern Passenger Association: To members located in this Association which comprises practically all the territory West, Northwest and Southwest of Chicago, wish to advise that no special rates have been announced, and you should therefore consult your Local Ticket Agent regarding fares from your home city, and where possible to do so, arrange to purchase your tickets thru unless you find that by purchasing tickets from your home town to St. Louis or Chicago, that you can then repurchase, taking advantage of the special rates from these points as shown in previous paragraph to New York City and return.

Circle tour tickets with six months

limit are on sale daily from Chicago (or intermediate points) by rail to New York, steamship to New Orleans, and rail to starting point at a rate of $75.00 including berth and meals while at sea. Circle tour tickets via Savannah are $58.88.

Special Train from Chicago.

For the accommodation of those going to the National Dental Association meeting to be held in New York, October 22-26, 1917, arrangements have been made with the Michigan Central Railroad to operate the "National Dental Association Special" leaving Chicago from the Michigan Central Station, 12th St. and Michigan Ave., at 5:40 P. M., Saturday, October 20th. This will be an all Pullman train consisting of club car, compartment car, standard sleepers, observation car and dining cars. The train will make intermediate stops on the Michigan Central at Kalamazoo, Mich., at 8:52 P. M.; Battle Creek, at 9:26 P. M.; Jackson, Mich., at 10:24 P. M.; Ann Arbor, Mich., at 11:14 P. M., and Detroit, Mich., at 12:01 midnight, and is scheduled to arrive in Niagara Falls at 7:25 A. M. Sunday, October 21st, where our train will be parked so that we may occupy the cars at any time during the day. The entire day may be spent visiting the various points of interest at Niagara Falls.

The Pullman fares from Chicago to New York including the occupancy of our cars if desired at Niagara Falls are $6.00 for lower berth, $4.80 for upper berth, $17.00 for compartment and $21.00 for drawing room.

Arrangements will be made with one of the principal hotels at Niagara Falls to serve breakfast. The special train will leave Niagara Falls at 7:20 P. M. Sunday, October 21st, and arrive in New York, 7:50 A. M. Monday, October 22nd, in ample time for the opening of our Convention.

The advantages of these special arrangements are many. They permit leaving Chicago at the close of the business day, Saturday, spend an entire day at Niagara Falls and still arrive in New York at a convenient hour on Monday Morning. It also gives us an opportunity of renewing old acquaintances and making new ones en route. Those desiring to use the "Special" from Chicago going thru to New York direct without stopping over at Niagara Falls can do so arriving at New York at 5:30 P. M. Sunday, October 21st by paying excess of $5.00 account fast time.

When purchasing your tickets, make sure that they read East of Chicago via the Michigan Central to Buffalo, N. Y. C. to New York. Account fast time, an excess fare of $5.00 will be charged on all tickets reading from Chicago to New York on this train, but to those stopping over at Niagara Falls, this excess will be refunded on presentation of tickets to the Depot Ticket Agents at Niagara Falls. For detailed information, consult any agent of the Michigan Central Railroad or write to Mr. Fred E. Deal, City Passenger Agent, Michigan Central Railroad, 228 S. Clark St., Chicago.

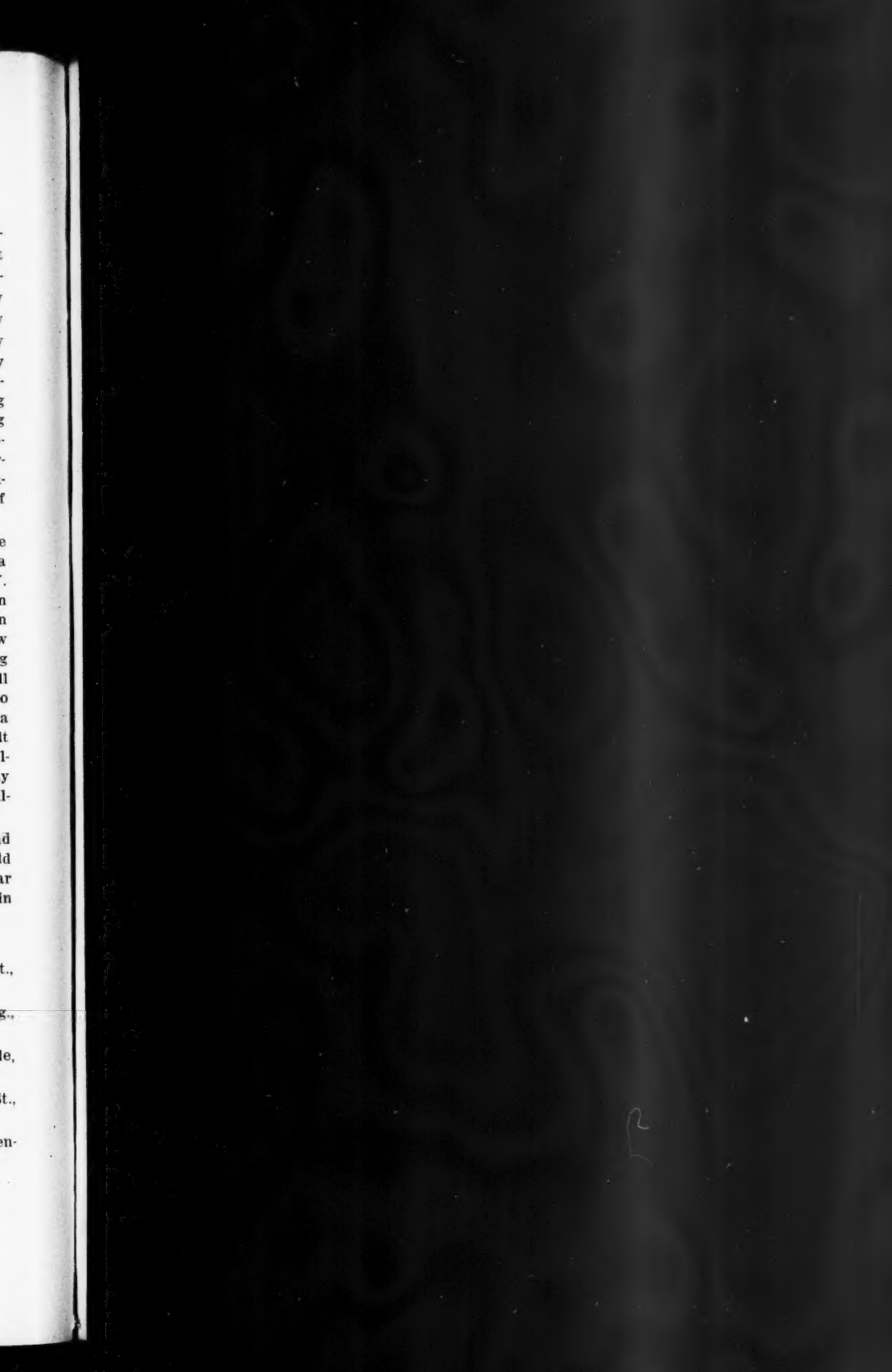
Let us get together this year and make this the best Convention ever held by our Association, and also try as far as possible to travel on the special train as outlined above.

Committee on Transportation.

D. C. Bacon, Chairman, 31 N. State St., Chicago, Ill.

Jos. D. Eby, 4th National Bank Bldg., Atlanta, Ga.

Max M. Eble, Starks Bldg., Louisville, Ky.

Roscoe A. Day, 1225 Washington St., Oakland, Cal.

Howard E. Seip, 721 Walnut St., Allentown, Pa.